Curſus Oſteologicus;

BEING A

Compleat Doctrine

OF THE

BONES;

According to the Neweſt, and moſt Refin'd Notions of ANATOMY.

Shewing their Nature, Subſtance, Compoſition, manner of Oſſification, Nouriſhment, *&c.* Alſo the various ways of their Articulation; together with the Parts to be conſider'd in each particular Bone of the whole SKELETON, as Figure, Cavities, Protuberancies, *Foramina*, Situation, Connexion and Uſe; with ſeveral Curious Obſervations relating to the BONES.

To which is Annex'd by way of *APPENDIX*, An Excellent Method of Whitening, Cleanſing, Preparing, and Uniting the Bones, to Form a Movable Skeleton, wherein the Bones may have the ſame Motions as in a Living Subject.

The whole being a Work very Uſeful and Neceſſary for all Students in Phyſick and Chirurgery.

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INTRODUCTION.

REctum eſt Regula ſui, & obliqui, *is an undeniable Axiom among the Mathematicians; the ſame may be ſaid of that thrice Noble Science call'd* **Anatomy**, *it being the Grand Foundation, or if I may ſo ſay, the Corner-ſtone both of Phyſick and Chirurgery, eſpecially the latter, it being the* **Baſis** *on which we build all our Structures towards the Cure of Diſtempers, both External, and Internal; for how is it poſſible we ſhould pretend to Cure any Interial Affect, unleſs we know what Part or* **Viſcera** *is affected; the*

like may be ſaid in Chirurgical Caſes; for what Surgeon can give a true Prognoſtick in Wounds, Ulcers, &c. *or Reſtore Luxated or Fractured Limbs, or perform any Manual Operation, without a true Knowledge of the Oeconomy of Humane Body; and this ought not to be a bare Knowledge only of the Parts, and where they lye (as many who are unwilling to give themſelves the Trouble of Scrutinying into the more nice Compoſition of them) but we ought alſo to know the Figure, Structure, Uſe, what Juices they ſeparate, and the like, all which the Doctrine of* **Anatomy** *teaches; for to what a prodigious height is the Art of Medicine improved, ſince our moſt Ingenious and Accurate Countryman,* Doctor **Harvey**, *found*

found out and demonſtrated the Circulation of the Blood; Jolivius *the* Lymphatick *Veſſels*; Caſper Aſſellus *the* Venæ Lacteæ; *and* Haver's *the Articular Glands*; *with many more great Improvements, which are too long to mention*; *nay, the whole Method of Phyſick is almoſt alter'd*; *and this Great and Noble Work could ne'er have been perform'd, had thoſe Learned Men contented themſelves with a bare Knowledge of the Parts only*; *for ſuppoſe any had a Pile of Building to Erect, would they think you, employ any one who is Ignorant of what Figure or Size the Stones or Timber ought to be, and how to be join'd together? The ſame may be ſaid of a Chirurgeon, or Phyſician, who is ignorant of A-*

natomy ; *ſo that whoever is willing to perform the* Duty *of a Good and Conſciencious Surgeon, ought to know the whole Fabrick of Man's* Body ; *and that as well in its perfect, and ſound ſtate, as morbid, that he may re-eſtabliſh Health when loſt, and reſtore unſound Parts to their former Sanity.*

I ſhall not here Harangue, *or run out in the many Praiſes which are due to* Anatomy, *or Treat of its Origin and Antiquity ; it being already ſo excellently well perform'd by the* Learn'd Doctor Charleton, *in the Preface to his Anatomic Prelections, but proceed to the Matter in hand.*

Various are the Opinions of Authors, about the Parts we ought to begin with, in Anatomical Demonſtrations.

monſtrations. **Bartholinus** *ſays, We ought to begin with the Te-guments, they being firſt in view, then proceed to the* **Viſcera**, *and Muſcles, and laſtly, end with the* Bones; *and the Reaſons he gives for it, are becauſe the* Bones *cannot be examined before they appear, which they cannot do, (ſays he) 'till all the Muſcles are ſeparated from them; others begin with the* **Abdomen**, *or Lower Belly, ſo proceed to the* **Thorax**, *then to the Head, and laſtly, to the Extremities; by reaſon the Belly is apt to ſend forth in a little time, very noiſom and offenſive Smells, which would hinder the Operator from proſecuting his intended Deſign: 'Tis true this is the beſt way, ſuppoſing we have but one Subject to work on,*

and that we be obliged to ſhew all, or moſt of the Parts *on this one Subject.*

Galen *ſays we ought to begin with the* Bones, *and gives many Cogent Reaſons to prove it; firſt, becauſe they ſerve as Beams or Supporters of the whole Body. Secondly, they ſerve to faſten the Muſcles too; for how can we tell the* Origin *or* Inſertion *of any Muſcle, if we be wanting in the true Doctrine of the* Bones; *nay, all the Parts ſeem as if deſign'd for their uſe; for when the* Bones *ceaſe to grow, they alſo put a Period to the growth of all the other Parts.*

Laurentius *ſays, that in the Anatomical School of* Alexandria, *the Young Students in Medicine, always began their*

Anatomical

Anatomical Course with the Osteology, *and then proceeded to the Doctrine of the Muscles, several of which receive their Denominations from the* Bones, *which they pass by, or lye on, as the* Tibialis Posticus, *and* Anticus *the* Peronii, Scapulares, Sternohyoidei, Mastoideii, *&c. Lastly, the Knowledge of the* Bones *is of that great use to a Surgeon, that it's impossible for him to restore well a Fracture or Dislocation, who is Ignorant of the* Structure, Figure, Articulation, &c. *of the Fractured or Dislocated* Bone.

All these Reasons are a sufficient Inducement to perswade us, that we ought to begin with the Skeleton, and then proceed in order, to the Rest of Man's Body.

The

Introduction.

The Skeleton is an Aſſemblage of all the Bones of the Body; it's either Natural, or Artificial; the Natural, is when the Bones are all excarn'd, but kept together by their proper Ligaments; the Artificial one, is when the Bones are Artificially Cleans'd, Whiten'd and Join'd together by Wiers.

That part of Anatomy *which Treats of the Bones, is call'd* Oſteologia, *which is as much as to ſay, A Diſcourſe of the Bones.*

We ſhall in this Tract examine what belongs to the Bones in general, and what belongs to each particular; which we ſhall divide in ſeveral Demonſtrations.

Curſus

Curſus Oſteologicus:

BEING A

Compleat Doctrine

OF THE

BONES, &c.

Demonſtration I.

Of the Bones in General.

THE Doctrine of the Bones in General, conſiſts in theſe Eleven Things, as Definition, Subſtance, Compoſition, manner of Oſſification, Veſſels, Nouriſhment, Differences, Parts, or Things to be conſider'd in the Bones; together

What to be conſider'd in the Bones in General.

together with their manner of Articulation, Number and Uſe; of all which in order.

Antient Definition.

Galen defin'd a Bone to be the moſt hard, firm, and terreſtrious part of all the Body. *Laurentius* adds, and ſays, That it's ingendred by the formative Faculty, by reaſon of great heat, out of the moſt craſs and terreſtrious part of the *Semen*, to ſerve as a Foundation to all the Body, and to give it Shape and Figure; but this Definition, as it is not compleat enough, ſo on the other hand, the word Faculty, is a Term which they uſed to expreſs themſelves by, when they were at a loſs for an Anſwer or Solution to any Queſtion propoſed; beſides, it's not at all agreeable to the Idea we have of the formation of the Bones, or Uſe; yet it's certain the Antients made uſe of that Term to explain moſt of the Actions of the Body; for when they were to declare how the Chyle, or Blood was made, or how the Bones or Cartilages were form'd, nay, how the Senſes acted; they anſwer'd, That the Stomach had a Chy-

a Chylific Faculty, the Liver a Sanguifying; the Bones were form'd by an Oſſific, and the Cartilages by a Cartilaginous Faculty, that the Eye ſaw by the Viſive Faculty; *& ſic de cæteris.*

This was a general Anſwer, by which they eluded (as well by their occult Qualities) all Difficulties propoſed to them, ſo that their Pupils were as Ignorant at the finiſhing of their Studies, as at the beginning; but we at this Day explain all theſe Actions purely Mechanically; as I ſhall ſhew in demonſtrating each part of the Oſteology exactly, that the Action which it performs, abſolutely depends on its Structure, ſo that it can do nought elſe, but what it does.

Modern Definition.

But to return from whence I have digreſs'd; the Moderns ſay a Bone is a ſimiler part, moſt dry, cold and hard, without ſenſe, (unleſs by ſome Preternatural Accident) inflexible, affording Stabiliment, Figure and Form to the whole Body.

A Bone may be consider'd at two distinct times, either before or after the Birth.

Nature and Substance.

In their beginning, or before the Birth, they are of a Membranous Substance, wrapt up, as it were, in very many folds, or *Laminæ*; which at first are Gelatinous, in time grow Cartilaginous, and at last when sufficiently indurated by the Ossific Liquor, are so strong as to resist all inward force, and their Parts which had before some Heterogeneous Bodies in their Insterstices, being squeezed closer by the power and pressure of the Spirits, dis-engage themselves from those Bodies which lye between their *Laminæ*, so grow more solid, wholly fixt, and void of motion, which is about the time when the Bones have attain'd their full perfection of growth, which also puts a period to the bulk and magnitude of the Body, so that they are no more extended or enlarged, either in breadth or length.

Composition of stringy Fibrils.

The Bones are composed of many strings, or threads, which have their course

courſe according to the length of the Bones, or their Figure; for if the Bone be of an unequal, or irregular Figure, the ſtrings are alſo unequal, and irregular; except in the *Cranium*, where the threads begin at a point, (ſometimes two or more) for the moſt part in the Centre, and terminate in the Circumference of the Bone, as the Spokes in a Wheel; for which reaſon it's more thick, and compact there, than in the Circumference, the thready Fibrils being more cloſe and united there, which is viſible in the *Cranium* of a *Fœtus*; the Bones have alſo ſome tranſverſe Fibres, to hold the long ones in; which may be ſeen in the Bones of the *Tarſus*, as alſo in the Extremities of moſt of the long Bones, where the Poroſities are.

Where the Offification begins.

The Offification begins not in the ſame place of every Bone; in the long Bones it begins in the middle, and towards each end; but in Bones of an irregular Figure in ſeveral places, as may be ſeen in the *Oſſa Innominata* of a *Fœtus*, where it begins at three points or places at once, ſo that they ſeem

ſeem to be three diſtinct Bones united juſt in the middle of the *Acetabulum*, but in time, as the Oſſification increaſes, they grow more ſtrong, the fibrous threads join, and ſo make but one Bone; for if the Bones ſhould have been totally Oſſified before the Birth, how ſhould the *Fœtus* paſs through the *Vagina* of the Womb as it doth? For it's without Diſpute, that both the Bones of the Head, and alſo the Hips of the *Fœtus*, give way ſomewhat in time of Excluſion; for it's obſerved, that thoſe Animals which have long and ſmall Heads, but big Bodies, have the Bones of their Head wholly Oſſified before the Birth, but their Ribs not, ſo careful is Nature in this Affair.

Why the Bones are not totally Oſſified before the Birth.

In the Skull, and moſt broad thin Bones, as the *Sternon*, the Oſſification begins at two, three, or more points, commonly about the Centre; Nature is alſo very cautious in Oſſifying long Bones all at once; for if their Extremities had been Oſſified as ſoon as their middle, the ligamentous and tendonous threads would not enter

ter ſo eaſily their ends, to join them together, which they can do, being not totally Oſſified. The Oſſification, as I ſaid afore of the *Oſſa Innominata*, begins at three points, that they may have the greater ſolidity; but quite contrary in the Bones of the *Cranium*, for while the middle of moſt Bones of the *Cranium* are fully Oſſified, their edges are only Membranous, that they may give way ſomewhat in time of Birth, which they would not, were the *Cranium* compleatly Oſſified. Theſe are the Reaſons why Nature retards Oſſification in ſome Bones, and advances it in others.

Veſſels.

The Bones before they be throughly indurated, have many Blood-veſſels, which are obliterated, as ſoon as the Meduller Glands are large enough to ſeparate the Oily Particles from the Arterial Blood, (which have a Property of keeping the Bones ſoft) then the Oſſific Liquor which is emitted from the aforeſaid Glands hardens them, and ſo preſſes the Parts cloſer together, and hinders the Blood from paſſing and repaſſing as uſual, when

they were ſofter, their bony threads gave way, and being then not preſt ſo cloſe; which Veſſels are alſo bonified by the Oſſific Juice, having loſt their firſt uſe; yet ſome few remain, which ſerve only the Meduller Glands, for their Nouriſhment, the Pulſation of Blood in them having ſtrength enough to ſcatter the Fibrils of the Bones in that Part, and ſo makes paſſages for themſelves.

Nouriſhment twofold. The Bones are nouriſhed two ways, the one in their beginning, that is, when they are only Membranous, and is quite different from the Nouriſhment they receive after their Perfection; for now they are nouriſhed as all *When Membranous.* other Membranes, with Blood immediately from the Arteries, ſo that if you then cut them, you'll find every thread bloody, which is not ſo when truly Oſſified; for when the Bones have occaſion of greater ſolidity, Nature then changes her way of Nou- *When Bony.* riſhment, which is by a peculiar Liquor of a Saline Tartarous Nature, prepared by the Meduller Glands, the more oily Particles being ſeparated, and

and kept in them, which is that we call the Marrow; this Liquor, I ſay, inſinuates its ſelf all along the bony ſtrings, and is viſible in a Fractured Bone, it appearing at their Extremities, and meeting together cauſes them to reunite, which we call *Callus*; nay, we often find that the adjacent Parts are ſometimes indurated by this Oſſific Liquor, and the Limbs often grow Gouty, and has not its former nimble motion, the *Callus* growing too big; for if they were bloody Particles, which exuded forth of their bony threads, inſtead of generating a *Callus*, it would Impoſtumate, for all Blood ſhed out of its Veſſels putrifies, this Liquor is of ſuch an indurating Quality, that if the Fibrils of the Bones be any ways broken, that it ſheds it ſelf in any great quantity, it will Oſſifie the very Tendons; I have ſeen the Marrow it ſelf turn'd bony.

Medulla Quid.

Callus Quid.

The Bones have Nerves (is plain) although no Senſe, for when they come to the ſolid Subſtance of the Bone, they are preſt ſo cloſe, that the Animal Spirits cannot enter their Sub-

Nerves, but no Senſe.

Acids soften the Bones.

ſtance, and ſo conſequently can have no feeling, unleſs ſoftned by Acids, which will cauſe them to have a dull Senſe, as may be try'd by the uſe of Acids on the Teeth; which, as the acidity goes off, reaſſume their former hardneſs, and inſenſibility. Sometimes the Blood acquires ſuch an acidity which is apt to cauſe a *Spina Ventoſa*, which is nothing elſe but a Cariosity of the Bones, proceeding from an Acid Blood coming to the Medullar Glands for the Nouriſhment of the Bones; alſo Acid Acrid Humours in an Ulcer may cauſe a Cariosity.

Cauſe of a Spina Ventoſa.

Differences Nine.

The Differences obſerved in the Bones, may be derived from Nine Things, *viz.* from their Subſtance, Quantity, Figure, Situation, Uſes, Motion, Senſibility, Generation, and Cavities.

(1.) *From their Subſtance.*

The Firſt Difference is derived from their Subſtance, for ſome Bones have a very hard one, as the *Tibia*; others leſs hard, as the *Vertebræ*; and finally, others have a more ſoft and ſpongy one, as the *Sternon*.

The

The Second is derived from their Quantity, for ſome are very large, as thoſe of the Thigh, Leg, Arm, *&c.* others leſs, as thoſe of the Head; ſome leaſt of all, as thoſe of the Fingers. (2.) *From their Quantity.*

The Third proceeds from their Figure; ſome are long, as the *Os Femoris*, *Tibia*, *&c.* others ſhort, as thoſe of the Fingers, and *Metatarſus*, *&c.* ſome round, as the *Rotula*; others flat, as the *Oſſa Palati*; others ſquare, as the *Oſſa Parietaria*; others triangular, as the firſt Bone of the *Sternon*, *Scapula*, *&c.* (3.) *From their Figure.*

The Fourth is from their Situation, as ſome are plac'd in the Head, others in the Trunk, and ſome in the Extremities; others are ſeated deeply, as the Officles in the Cavity of the Ear, *&c.* (4.) *From their Situation.*

The Fifth is from their Uſe, as ſome ſerve to ſuſtain the Body, as thoſe of Legs and Thighs, others to contain and defend the Parts, as the Ribs defend the Lungs, Heart, *&c.* *Oſſa Innominata*, and *Os Sacrum*, the Bladder, Womb in Women, *&c.* *Cranium* the Brain. (5.) *From their Uſe.*

(6.) *From their Motion.* The Sixth is known by their Motion; for ſome have a more manifeſt motion, as the great Bones of the Extremities; others have a leſs, as thoſe of the *Tarſus* and *Carpus*; others none at all, as thoſe of the Head.

(7.) *From their Senſe.* The Seventh is from their Senſe, which is eaſily remarkt, for all the Bones, generally ſpeaking, have no Senſe, except the Teeth, and they only a very dull Senſe; except, as I have already obſerved, they be ſoftned by ſome offending Acid.

(8.) *From the time of their Generation.* The Eighth is taken from the time of their perfect Generation, and Perfection; for ſome Bones are perfect in the Womb, or before the Birth, as the ſmall Oſſicles of the Ears; and others, which do not acquire their Perfection, but as the Subject advances in Age, as all the reſt of the Bones of the Body, yet ſome of theſe Oſſifie quicker, as thoſe of the lower Jaw; others ſlower, as the *Fontanella* of the Head.

(9.) *From their Cavities.* The Ninth and laſt Difference is drawn from their Cavities, for ſome have great ones, and contain Marrow,

as

as the Bones of the Extremities; and there be others which have no manifeſt Cavity, but only Poroſities; which contain a Meduller Juice, as thoſe of *Tarſus*, *Carpus*, *&c.* ſome have holes, by which Veſſels paſs and repaſs, as thoſe in the *Baſis* of the *Cranium* and *Vertebræ*; others have only Trenches or Furrows, as thoſe of the *Sternon*, Ribs; others have Sineſſes, as the *Os Frontis*, and *Oſſa Petroſa*; laſtly, ſome are pierced like the holes in a Scive, as the *Os Cribriforme*.

The things to be conſider'd in the Doctrine of each Bone are three; 1. The Apophiſis. 2. Epiphiſis. And 3. Cavities, Furrows, and Sinuſſes. *Things conſider'd in the Bones.*

Firſt, The Bones not being of one even Form, or Figure, have at their Extremities ſeveral Prominencies, or Protuberancies, which are of two ſorts, the one is a continued part of the Bone jetting manifeſtly out, above its ſuperficies, ordain'd for the more commodious and ſtrong inſertion of (1.) *Apophyſis, or Proceſs.*

the Tendons of the Muſcles, and is call'd an Apophyſis, or Proceſs.

(2.) *Epiphyſis, or Apendage.* The Second is an additional Bone growing to another by immediate contiguity, as if Nature had forgot to make the Bone long enough, and is generally more porous than the Bone it ſelf; which will ſeparate if you boil in Oil, for they will not ſeparate if boil'd in Water never ſo long, unleſs the Subject be very young, it's call'd an Apendage, or Epiphiſis; this in young Bodies may ſometimes by great force be ſeparated from the reſt of the Bone, or to ſpeak improperly, Diſlocated.

If this Protuberance be round, it's call'd *Caput*, under which is the *Cervix*, as in the ſuperior part of the *Os Femoris*; if it be flat, *Cordilus*; if ſharp, *Corone*; others from their figure are call'd Styloides, Moſtoides, Coracoides, Ancyroides, *&c.*

Embrions have not theſe Protuberances ſo large; for except ſome very few large ones, they are hardly viſible.

Theſe Protuberances are either Natural, as the *Spina* of the *Scapula*; the reſt are only Accidental.

The Accidental Protuberances of the Bones, (which are only manifeſt when the Bones are perfect) are cauſed by the Tendons of the Muſcles or Ligaments, which always are inſerted there; for the ſtringy Filaments of the Tendons and Ligaments, entring into the Bones (while ſoft) between their ſtringy threads, cauſe them to inlarge there into a bulk, which it muſt do of neceſſity, there being a double portion of Fibres united together; which are all Oſſified as the bony Liquor increaſes. *Cauſe of the Protuberances.*

It's a general Note, that where you find ſuch Protuberances, ſome Ligaments or Tendons of Muſcles are inſerted there; although theſe Protuberances ſeem only to be accidental, yet they have many uſes; firſt, by them the Muſcles have a greater force to lift or pull up the Part. Secondly, they are of uſe to inlarge the Extremities of the Bones, that the Body be ſuſtain'd. *Uſes of the Protuberances.*

The

(3.) *Cavities of three sorts.* The next part of the Bones, that come under our Consideration, are the Cavities, which are either External or Internal: These Cavities are of three sorts, Holes, or *Foramina*; Trenches, or Furrows, and Sinusses.

(1.) *Foramina, or holes.* A *Foramina*, or Hole, is a Cavity which is perforated in a Bone, or made up of two Bones join'd together, as may be seen in the *Basis* of the *Cranium*, lower Jaw, *Vertebræ* of the Ribs. They are design'd for the passage of the Vessels and Nerves, which pass through them, also the great Cavity of the *Ischium* may be call'd a Hole.

(2.) *Trenches, or Furrows.* A Trench, or Furrow, is not a Cavity through the Bone, but only a deep hole, or hollowness, long, or round, as the orbit of the Eye, *&c.* sometimes very shallow, as those in the inside of the *Cranium*, *&c.* some of a mean between both, as those in the Joints, to receive the Protuberances of other Bones; some call these Sinusses, but improperly.

(3.) *Sinusses.* A *Sinus* is a sort of Cavity in a Bone, whereof the Orifice or Entrance is very

ry

ry ſtrait, and the bottom large, ſuch are in the Frontal Bone, *&c.*

I ſhall declare the uſe of all theſe Cavities, when I Treat of each Bone in particular.

All the long Bones of the Body are hollow in the inſide towards the middle, and contain a Marrow, which is only a heap of Membranous Veſicule, full of a fatty or oily Subſtance, call'd Meduller Glands; which, as I obſerved before, ſeparated the more oily Particles from the Blood, ſo that the more ſaltiſh only remain'd, which has the Oſſific Virtue of rendering the Bones hard: The Ends or Extremities are porous, ſomewhat like a Pumice Stone, containing a Meduller Juice, like thin Oil, and have very few Glands; it's probable that the Ligamentous ſtrings entring the top of the Bones, divide and ſcatter the bony threads, which make it ſo porous.

All long Bones hollow.

Meduller Glands.

Meduller Juice.

The External Superficies of all Bones have a certain ſolid *Cortex.*

Solid Cortex *in all Bones.*

All the External Cavities which ſerve for Articulation, have at their Circumference an Eminence call'd a Lip,

Lip, to which is faſtned a Circular Ligament, which embracing the Head of the received Bone, fortifies the Articulation.

As for each particular Proceſs and Cavity, we ſhall deſcribe them in the Demonſtrations of each particular Bone.

Before I mention the Articulation of the Bones, I think it convenient to obſerve theſe things.

The Bones not of the ſame bigneſs in Women as in Men.

Firſt, All the Bones are not of the ſame greatneſs, and that not only in Perſons of different Stature, but alſo in thoſe of an equal Height, or Stature; for ſome of theſe have their Bones ſmaller than others, and it's Beauty conſiſts (as ſome have ſaid it does) in the delicateneſs and ſmallneſs of the Bones, then Women have all the Reaſon imaginable to have a better Shape and Symetry than Men, by reaſon their Bones are ſmaller; the Bones alſo of their Face are finer and more ſmooth.

Difference of the Oſſa Innominata.

There's alſo a great difference between the Bones of the *Oſſa Innominata*,

tu, which makes the *Pelvis*. In Men they are leſs and more unequal, but in Women larger, and ſmoother, to have a greater ſpace to contain the Womb; alſo a Woman's *Os Sacrum* inclines more backwards than a Man's which makes their Buttocks more large.

We muſt alſo obſerve a difference in the Bones, according as we grow in Years; for from the Birth to the twentieth Year, or thereabouts, the Bones continually increaſe, and from that to the ſixtieth they continue in the ſame ſtay, neither increaſing or diminiſhing; but after that they daily diminiſh, by reaſon of the bony Fibres drying, approach nearer one another, and ſo muſt conſequently have a leſs bulk. *Difference of the Bones according to Age.*

The Colour of the Bones is not alike in all; for ſome have them very white, others leſs, but ſome almoſt greyiſh; ſo that if you take the ſame Pains in whitening two or three Skeletons, yet one will be doubtleſs whiter than the other. *Difference from the Colour.*

It's

Perioſtion. It's true, as I have obſerved before, that the Bones have no ſenſe; yet they are Inveſted with a very ſenſible Membrane, call'd *Perioſtion*, as if we ſhould ſay a Membrane over or inverſing the Bone, it's very thin; all Bones have this, except the Teeth. I think there's a great Queſtion about its Uſe. Some affirm it's to convey bloody Veſſels to the Bones; but its rather believed to be for the greater implantation of the Tendons of the Muſcles; for when you ſeparate the *Perioſtion*, the Muſcle comes off with it.

Uſe.

I ſhall now proceed to the manner of the Articulation of the Bones; there's ſuch Art in the Conjunctions of the Bones, that they have ſerved as a pattern to many Artizans in their Curious Works; for they could find nothing in Nature more fit to copy by; and although there be ſo many various ways of Articulation, as almoſt Junctures, yet they are all neceſſary, otherwiſe Man could never move himſelf every way ſo compleatly as he does.

Articulation of the Bones.

The

The Bones join'd together have either motion, or none, the former is call'd Articulation, the latter *Symphyſis*, or growing together.

Articulation, is either for manifeſt, or obſcure motion: The firſt is call'd *Diarthroſis*, or looſe Articulation, the other *Synarthroſis*, or more cloſe and compact. *Articulation twofold.*

Diarthroſis is Threefold, 1. *Enarthroſis.* 2. *Anthrodia.* 3. *Gynglimus.* 1. Diarthroſis *threefold.*

1. *Enarthroſis*, is when a large Head is received into a deep Cavity, as the *Os Femoris* in the *Acetabulum* of the *Oſſa Innominata.* Enarthroſis.

2. *Arthrodia*, is when the Cavity is ſhallow, and the Head of the received Bone alſo ſhallow and flattiſh, as the *Os Humeri*, with the *Scapula*, and the Bones of the *Metacarp* and *Metatarſe*; with the firſt *Phalanx* of the Fingers and Toes. Arthrodia.

Now the Bones which are Articulated by *Enarthroſis*, and *Arthrodia*, are capable of all ſorts of motion, as upwards, downwards, forwards, back-

backwards, and circularly; yet the deeper the Cavity, and the more bony the Edges are, the motion is render'd more ſlow, and not ſo briſk and nimble as when the Cup is not ſo deep; this is ſeen in the *Os Femoris*, and *Acetabulum*, for the *Os Humeri* being inſerted in a more ſhallow Cup, is capable of all ſorts of motion, and that to a great degree, yet about the Cup of the *Scapula* there are ſeveral Cartilages, which make it ſeem as deep as the *Acetabulum*, but at the ſame time by giving way, hinders not the very free motion of the *Humerus*.

Theſe two all ſorts of motion.

Ginglimus *threefold.*

Ginglimus, is when the ſame Bone both receives, and is received, and is Threefold. 1. *Ginglimus Proximus.* 2. *Longus.* 3. *Compoſitus.*

Proximus.

1. *Ginglimus Proximus*, is when a Bone is received by another, and receives the ſame, as the lower part of the *Os Humeri*, and *Ulna*.

Longus.

2. *Ginglimus Longus*, is when two Bones are join'd together according to their length, ſo that the one Bone having a Cavity in its ſide towards the end,

end, receives the head of the other, which has a Cavity likewiſe at its other Extremity, to receive a Protuberance of the firſt Bone, as the *Radius* and *Ulna*.

2. *Ginglimus Compoſitus*, is when a Bone receives one, and is received by another, as in ſome of the *Vertebræ* of the Back, where one receives the upper, and is received by the lower: *Ginglimus Compoſitus*, is alſo when a long Proceſs of a Bone is inſerted into another above it, and ſo turns in the Cavity as an *Axis* in a Wheel, as the ſecond *Vertebra* of the Neck with the firſt. Compoſitus.

As *Enarthroſis*, and *Arthrodia*, ſerve for all ſorts of motion, *Ginglimus* ſerves only for Flexion, and Extenſion; yet in the *Radius* and *Ulna* it ſerves for Pronation and Supination. Ginglimus *for Flexion and Extenſion only.*

When a Bone is join'd by double *Arthrodia*, it makes a ſort of *Ginglimus*, as may be ſeen in the lower Jaw.

Synarthroſis, or obſcure motion, is in the Ribs which have a little motion in their ends towards the *Vertebræ* in Synarthroſis.

Reſpiration; alſo moſt of the Bones of the *Tarſus* and *Carpus*, which in great preſſure give way a little, for the more eaſie motion of the Part.

2. Symphyſis *Threefold.*

Symphyſis, is only when the Bones are united without any motion at all, and is Threefold, as *Sutura*, *Harmonia*, and *Gomphoſis*.

Sutura.

1. *Sutura*, is when the Bones are united together in their edges by little Points, or Teeth (as it were) unequally, as may be ſeen in the Bones of the *Cranium*.

Harmonia.

2. *Harmonia*, is an union of the Bones by a ſimple Line only, either ſtreight or curved, as the Bones of the Noſe, Face, Palate; but this is only in their outward part, for we always find them Internally Serratil, or Suture like.

Gomphoſis.

3. *Gomphoſis*, is when one Bone is faſtned in another, as a Nail in Wood, ſo are the Teeth in the Jaws.

Some add to the *Symphyſis* ſeveral other ſorts of Articulations, as *Synchondroſis*, *Syſſarcoſis*, *Syneuroſis*, *vel Syntenoſis*.

Syn-

Synchondrosis, is when a Cartilaginous Substance interveens, as may be seen in the middle of the lower Jaw; which in young are two distinct Bones, but as the Ossific Liquor predominates, grow one; also the *Ossa Pubis* are united by it, so are the Bodies of the *Vertebræ* one to another. Synchondrosis.

Syssarcosis, is when a Bone is fastned by Means of Flesh only, as the *Os Hyoides* in the Mouth, and the *Scapula* to the Ribs. Syssarcosis.

Syneurosis, *vel Syntenosis*, is when Bones are united together by means of Ligamentous Parts, as the *Rotula* with the Bones of the Legs; but I think these are not properly Articulations. Syneurosis.

The Bones of the Body in an Adult, are accounted 245. For Example, the Head has 64, the Trunk 57, the Arms and Hands 64, the Legs, *&c.* 60, which makes in all 243. Some perhaps may wonder why the Great Creator composed such a number of Bones; I Answer, how could the Hand or Arm perform all the Actions it does, and put it self in so many Thousand *Number* 245.

Poſtures, had it not many Junctures and Articulations? For had the Part been compos'd but of one or two Bones, how Lame and Prepoſterouſly would it have acted? The ſame may be ſaid of the Legs, *&c.* And if the *Spine* had not been made up of ſuch a number of *Vertebræ*, how could we have bent, or mov'd it as we do? It was therefore convenient and neceſſary for the Perfection of Man and his Functions, to have as many Bones as he has.

Head 64. The Head, as I ſaid, is made up of 64 Bones, which are thus number'd, 6 proper of the Skull, 8 of the Ears, 4 in each, 3 Common of the Skull; Face 11, with the *Vomer*; *Os Hyoid* 1, lower Jaw 1, though ſome make it 2, Teeth about 32, which make 62; but if you add the *Oſſa Spongioſa*, they make 64.

Trunk 57. The Trunk conſiſts of 57 Bones; *Vertebræ* 25, as 7 of the Neck, 12 of the Back, 5 in the Loins, and 1 in the *Os Sacrum*, which ſome ſay is made up of 5; 3 in the *Coccyx*, Ribs 24, *Sternon* 3, *Oſſa Innominata* 2, which makes

A Table of the BONES.

- **The Bones of the Body are those; of the**
  - **Head,**
    - Whose Parts are either of the *Cranium*, which has,
      - Proper Bones 6, as,
        - *Os Frontis* 1.
        - *Ossa Sincipitis* 2.
        - *Occipitis* 1.
        - *Temporum* 2.
          - In whose *Foramina Auditoria* are 8 Bones, 4 in each.
            - *Malleus.*
            - *Stapes.*
            - *Incus.*
            - *Os Orbiculare.*
      - Common Bones 3.
        - *Os Sphenoides.*
        - *Os Cribriforme.*
        - *Os Jugale.*
          - To which is annex'd, *Ossa Spongiosa* 2.
      - Of the Bones of the Face,
        - In the Superior part are 11 Bones; 5 pair and an odd one, Upper Jaw.
          - *Ossa Triangularia.*
          - *Ossa Lachrimalia.*
          - *Ossa Malæ.*
          - *Ossa Nasi.*
          - *Ossa Palati.*
          - *Os Vomer.*
        - Lower Jaw 1.
          - Teeth in both Jaws 32.
            - *Incisorii* 8.
            - *Canini* 4.
            - *Molares* 20.
    - To which is Annexed, the *Os Hyoides*, join'd by *Syssarcosim.*
  - **Spine**, in which are the Bones of the
    - Neck, in which are 7 *Vertebræ.*
    - Breast, divided into the
      - Fore-part, in which are,
        - Clavicles 2.
        - *Ossa Pectoris* 3.
      - Lateral-part, in which are,
        - Ribs 24.
      - Back-part, in which are,
        - *Scapulæ* 2.
        - *Vertebræ* 12.
    - Loins, divided into the
      - Fore-part, in which are,
        - *Ossa Pubis* 2.
      - Lateral-part, in which are,
        - *Ossa Ilia* 2.
        - *Ossa Coxendicis* 2.
          - These join'd together in Adults, make up the *Ossa Innominata.*
      - Back-part, in which are,
        - *Lumborum Vertebræ* 5.
        - *Os Sacrum*, which some make 5.
        - *Ossa Coccygis* 3.
  - **Limbs**, which are either,
    - Superior, or Hands, divided into
      - *Os Humeri* 2.
      - *Cubitus ejus*
        - *Radius*
        - *Ulna*
      - Lower-part, or Hand, strictly so called, whose Parts are,
        - The Wrist 8.
        - *Metacarpus* 4.
        - Fingers 15.
          - Three in each.
        - To which are annex'd, some *Ossa Sesamoidea.*
    - Inferior, or Feet, divided into
      - Bones of the
        - Thigh
        - *Patella*
      - Leg, strictly so call'd,
        - *Tibia*
        - *Fibula*
      - Lower-part, or Foot, strictly so call'd, in which is
        - *Tarsus*, Bones 7.
        - *Metatarsus* 5.
        - Fingers or Toes 14.
        - To which are annex'd, *Ossa Sesamoidea.*

makes up the number of 57. I once ſaw a Skeleton which had 13 Ribs on each ſide.

The upper Extremities, or Limbs, conſiſt of 64 Bones, taking in the *Claviculæ*, which I think we ought to do, ſince much of the motion of the Arms depends on them; there's 32 Bones in each Arm then, as *Clavicula*, *Scapula*, *Os Humerus*, *Radius*, and *Ulna*; 8 Bones of the *Carpus*, 4 of the *Metacarp*; and Bones of the Fingers 15, 3 in each, accounting the Thumb as one Finger, which added to the other Arm makes 64. *Upper Limbs 64.*

The Lower Extremities conſiſts of 60, that is, 30 in each; as the *Os Femoris*, *Rotula*, *Tibia*, and *Fibula*; 7 in the *Tarſus*, 5 in the *Metatarſus*, and 14 in the Toes, which makes together with the other Leg 60. *Lower Limbs 60.*

Some augment the number, who make many of the *Os Hyoides*, 3 of the *Os Innominatum*, 2 of the lower Jaw, 5 of the *Os Sacrum*, and add the *Oſſa Seſamoidea*, which are not often found, and then for the moſt part in the great Toes, which would then make up above 250.

Use of the Bones.

I am come now to the laſt Conſideration of the Bones in General, which is their Uſe.

They have many Uſes; 1. They ſerve for the ſupport of the Body, being as ſo many Beams or Pillars in a Houſe. 2. For the Defence of ſome Noble Part, as the Skull for the Brain, Ribs for the Heart, Lungs, *&c.* *Oſſa Innominata* and *Sacrum*, which make the *Pelvis* for the Womb, Bladder, *&c.* 3. For the Progreſſion and Motion of the Animal, of which with the Muſcles, they are the only Inſtruments. 4. To give Shape and Figure to the whole Body; theſe are the General Uſes, as for their Particular, we ſhall ſpeak of them in the Demonſtration of each particular Part.

Demon-

Demonſtration II.

Of the Bones of the Skull.

WE now come to the Doctrine of the Bones in particular; we divide the Skeleton into three parts, as the Head, Trunk and Limbs. *Skeleton divided into three parts.*

By the Head we underſtand not only all the Bones of the Skull, but alſo thoſe of the Face, even from the *Vertix* to the firſt *Vertebra* of the Neck; by the Trunk all that compoſes the Neck, Back, Loins, *Os Sacrum*, *Oſſa Innominata*, *Sternon*, *&c.* By the Limbs thoſe which make up the Arms and Legs, generally ſo called; of all which in order. The Head is ſubdivided into the Skull, properly ſo called, and the Face.

The Skull (I mean that upper part whoſe Bones compoſe, and make up a large Cavity, which contains the Brain, in which you muſt conſider its Figure altogether) is globous, ſome- *Figure of the Skull.*

what long, but flattiſh towards the ſides, for the better Situation of the Temporal Muſcles; which being on, make it look more round.

Skull, two Tables. All the Bones of the Skull are made up of two *Lamina* or Plates, call'd Tables, one Internal, the other External, between which lyes a Medullar Juice, of a reddiſh Colour, call'd the Pith, or Diploe, which is very diſcernable in young Perſons; but as we grow in Years, the Oſſific Liquor invading, it bonifies.

Diploe, what.

The Exterior and Superior Superficies of the *Cranium*, is very ſmooth, and poliſhed, having few inequalities; but where the Sutures are, the Internal Superior Superficies is not ſo equal, having many little *Sulci*, or Furrows, which are cauſed by the Veſſels of the *Dura Mater*, when the Skull is but Membranous, being then capable of receiving any Impreſſion, that the Pulſation of the Veſſels give it, ſo make themſelves Furrows; but its Internal Inferior Part is very unequal, by reaſon of the many Productions and Cavities found there.

Cauſe of the Furrows.

The

The *Cranium* has many *Foramina*, which give way or paſſage to the Veſſels paſſing and repaſſing, which fill up theſe holes ſo cloſe, that no Fumes or Vapours, as the Antients believed, can get in, or come forth, unleſs by the Veſſels themſelves: we will ſhew all theſe holes, at the latter end of this Demonſtration. Foramina *in General.*

It's a Queſtion, whether it be the *Cranium*, which gives greatneſs to the Brain; or whether the Brain gives form to the *Cranium*; I Anſwer, that the bigneſs of the *Cranium* depends on that of the Brain, for two Reaſons; Firſt, the *Cranium*, while Membranous, eſpecially towards the Sutures, extends it ſelf more or leſs, as the Brain increaſes: The Second, is that the *Cranium* is not totally Oſſified till the Brain is arrived to its full Magnitude; for we ſee in an Infant new-born, that although the Brain be perfect, yet at the ſame time, the *Cranium* is only Cartilaginous about the Sutures; though bony in the middle of every Bone, nay, the *Fontanella* does not Oſſifie under ſome Years; from whence alſo *The bigneſs of the* Cranium, *depends on the Brain.*

also it is, that in Labour these Bones, as I have before observed, give way, and fold over one another, for the more easie *exit* of the Infant out of the Womb.

Sutures, twofold. The Bones of the *Cranium* are join'd together by Sutures, which are of two sorts, true, or false; or to speak more properly, common, or proper.

Proper, three. The Proper are Eight.

(1.) Coronalis. 1. *Coronalis, (vel Frontalis)* because the Antients used to wear their Garlands on that part of the Head, it reaches from one Temporal Bone to the other, joining the *Os Frontis* to the *Ossa Parietaria.*

(2.) Lambdoides. 2 *Lambdoides* being like the Greek Letter Λ, others call it *Triangularis*; this Suture is seldom wanting, whatever the rest are; it begins at the *Basis* of the *Os Occipitis*, and ascends obliquely to the middle of the back-part of the Head, and descends again to the other side of the Head; the Point in the middle is call'd *Vertix*, by reason the Hair on the Scalp commonly turns there; it joins the Occipital Bone

Vertix, what.

to

to the Bones of the Temples, and *Ossa Parietaria.*

3. *Sagittalis*, becauſe it runs lengthways as an Arrow; it begins at the *Vertix* of the *Sutura Lambdoides*, and marching ſtrait forwards to the middle of the Coronal Suture; in Children it divides the Coronal Bone, and goes quite to the Noſe, which as we grow in Years vaniſhes; yet I have ſeen it in the *Cranium* of ſome Adults. (3.) Sagittalis.

The Sutures being ſo united together, make up a Figure almoſt like this)—<.

Some of our Modern Anatomical Profeſſors, will have the Sutures to be Serratil only in the Superior Table, but join'd by Harmony in the Lower, but it's always found to the contrary.

The Common are Five, or more; theſe are the Chief, 1. The Suture *Squamoſe*, or Scale-like, becauſe apply'd as one Scale on another; they are two, one on each ſide, which ariſe from the outſide of the Maſtoid-proceſs, and circumſcribing the Temple- *Common, five.* Squamoſæ.

ple-bones, descend Circularly towards the *Basis* of the Ears.

Whatever Anatomists say, I think them true Sutures, being Serratil as well Internally, as Externally.

Orbalis. 2. *Orbalis*, it begins at the top of the *Sutura Squamosa*, and descending obliquely towards the Orbit of the Eye, crosses on the top of the Nose, so passes over the other Eye, and so on to the other Squamous Suture.

Nasalis. 3. *Nasalis*, which divides the Bones of the Nose.

Basilaris. 4. *Sutura Basilaris*, which separates the other Bones from the *Os Basilare.*

Ethmoides 5. *Sutura Ethmoides*, *seu Cribriformis*, dividing this Bone from the *Os Frontis*; some say that these Four last are rather *Harmonia*, than *Sutura*, but Demonstration shews the contrary.

Use of the Sutures. The Sutures have many uses, the principal are these; 1. Many Ligamentous Fibres pass through them from the *Dura Mater* to the *Pericranium*, which suspends the *Dura Mater*, so are a sort of hinderance of too violent Concussions of the Brain, in any great motions of the Body; for by these

theſe Fibres the Brain is kept more tight; it's by this Communication, that when the *Pericranium* is wounded, an Inflammation often ariſes in the *Dura Mater*, as if it had received ſome offence it ſelf: Theſe Fibres alſo, by ſuſpending the *Dura Mater*, and keeping it cloſe to the Interior Surface of the *Cranium*, the Arteries in the Cortical part have a freer motion, which would be ſomewhat impeded, if it fell on the Brain. 2. They give paſſage to ſeveral Veſſels, that are paſſing and repaſſing to the Diploe, for the Nouriſhment of the Bones of the *Cranium*. 3. They are of uſe in hindering Fractures from paſſing further than one Bone, for they always ſtop at the Sutures, which if the Skull were but one continued Bone, the Fracture would be apt to run over all the *Cranium*, as may be ſeen daily in any Earthen or Glaſs Veſſel, when crackt by a ſtroke, it commonly runs almoſt quite over, or round. Some ſay, a fourth Uſe is, to give a vent or breathing to many Fuliginous Vapours gather'd within the *Cranium*, but I much queſtion

queſtion this uſe; yet ſome ſay, that many who have had their Sutures too cloſe, have been ſubject to inſupportable Head-aches, Tranſpiration having been ſtopt, as they ſay; but I rather think it proceeded from the preſſure of the Veſſels which paſs through them, which cauſing an Obſtruction of the flowing Liquors, was a cauſe of theſe Pains.

Some have had no Sutures.

There are many Obſervations in ſeveral Authentick and Learned Authors, of ſome who have had none, or very few Sutures, and others who have had more than uſual. I ſaw a Skull lately in the Hands of an Ingenious Chirurgeon, my very good Friend, which had a Suture running tranſverſe the Occipital Bone, and the Sagittal paſs'd quite through the *Os Frontis*, and it was the Skull of an Adult; ſuch is the various Diſports of Nature; alſo in very Old Age the Sutures are almoſt obliterated, the Oſſific Liquor then predominating.

How the Sutures are made.

Embryons have no Sutures, or at leaſt not to be well diſtinguiſhed, their Skulls being wholly Membranous; ſo while

while the Oſſific Liquor, (which as I have ſaid, begins at a point, *&c.* in the *Cranium*) inſinuates it ſelf along the bony Threads, and by degrees hardens them, ſome Fibrous and Vaſcular Strings paſſing from the *Dura Mater* to the *Pericranium*, hinders in thoſe places the bony Liquor from uniting, ſo forms theſe Seams or Sutures; for in a *Fœtus* the Skull being as yet Membranous in its edges, wrap, or fold themſelves as it were one over another, to take up leſs room in the Birth; for had the Skull been totally Oſſified before the Birth, the Infant would for the moſt part endanger the Life of the Mother; this may be daily ſeen in young Children, where the Skull is wholly Membranous in the top of the Head between the Coronal and Sagittal Sutures, which place is call'd *Fontanella.*

Fontanella, *what.*

The Bones of the Skull are either Proper or Common; the Proper are Six in number.

Proper Bones of the Skull, Six.

1. The *Os Frontis*, or *Coronalis*, the Forehead-Bone; of a Semicircular Figure,

gure, in its ſuperior part, ſituated in the Superior part of the Face, and Anterior of the *Cranium*, bounded above by the Coronal Suture from the *Oſſa Parietaria*, on the ſides by the *Oſſa Temporum*, below by the *Tranſverſalis*, or *Orbalis* from the Noſe, Eyes, *&c.*

The things to be conſider'd in this Bone, are its Cavities and Proceſſes.

Its outſide is ſmooth, as are moſt of the Bones of the *Cranium*, no Tendons or Ligaments being inſerted here.

The Oſſification begins in this Bone at two Points, between the *Laminæ* of this Bone there's a Cavity call'd *Sinus Frontalis*; it's oft times double, which by two ſmall *Foramina* enter into the Noſtrils; this *Sinus* makes the inſide of this Bone ariſe in a ridge, which begins about the top of the Forehead, where the Hair grows not, and reaches to the *Criſta Galli*; for which reaſon we muſt not Trepan here, leſt we offend the *Dura Mater* on each ſide the ridge, whenas the middle is not perforated by much; the upper *Lamina* of this coming to the Eyes, where turning

1. Os Frontis.

turning inwards, makes up part of the Orbit on the upper ſide: This *Sinus* is lined with a thick Membrane full of Glands, which ſeparate a *Mucus* to moiſten the Noſe; in Brutes it's very large, but not ſo in Men; yet once I ſaw a Skull which had it extreamly large, and divided in four or five Cells, quite round the *Baſis* of the *Os Frontis*, ſo that the Internal Protuberances almoſt hid the *Criſta Galli*; yet ſometimes this *Sinus* is quite obliterated, and the Membrane turn'd bony, as the Oſſific Liquor increaſes, and we incline in Age.

In its lower part over each Eye is a ſmall *Foramen*, through which paſſes a Branch of the five pair of Nerves to the Muſculous Fleſh on the Forehead. Foramina.

It has Four Proceſſes; the two greater at the Internal *Canthus* of the Eyes, the other two at the leſs; its inner *Lamen* about the Eye-brows towards the Noſe, bunches inwards, ſo cauſes a hollowneſs there, which is part of the *Sinus Frontalis*. Proceſſes.

2. The *Os Occipitis* is oppoſite to the Coronal, in the hinder part of the 2. Os Occipitis.

Head, it's the thickeſt and ſtrongeſt Bone of the Head; the reaſon whereof is this, we having no Eyes behind, Nature has framed it of a thicker conſiſtence, to the end it may the better reſiſt any ſtroak or blow it receives; it's five-corner'd, join'd to the *Oſſa Parietaria* by the Lambdoid Suture, and to the *Oſſa Temporum* by the Squamous Sutures, and it's bottom to the *Os Sphenoides*, by a ſort of Harmony.

The things to be conſider'd in this Bone, are its Sinuſſes, *Foramina*, and Proceſſes.

Sinuſſes, or Sulci. Its Sinuſſes, or rather *Sulci*, are many, two on the External part juſt behind the *Foramen Medullare*; and ſeven in the Internal Superficies, the two largeſt of which contain the Protuberances of the *Cerebel*, the other are of ſmall moment.

Foramina. It has five *Foramina* or Holes, the loweſt and largeſt call'd *Foramen Medullare*, the Spinal Marrow paſſing by this hole to all the *Vertebræ*; the other four are leſs, and only ſerve for the *exit* of the Veſſels; two give paſſage to

to the Nerves of the Tongue, and two to the *Arteriæ Cervicales*; theſe are proper *Foramina*, there are two others which are common both to it and the other Bones, one on each ſide the *Os Petroſum*, which give paſſage to the eighth pair of Nerves call'd *par vagum*, and to the two Internal Jugular Veins.

It has five Proceſſes, four of which are on the outſide by the *Foramen Medullare*; the two innermoſt are call'd *Condyli*, and are received by the two ſhallow *Sinus*'s of the firſt *Vertebra* of the Neck, ſerving for the Articulation of the Head; in its Internal part it has a long Protuberance or Ridge, which aſcends in the middle from the *Foramen Medullare*, and parts the Protuberances of the *Cerebellum*, this is its fifth Proceſs. *Proceſſes.*

There's another ſmall Protuberance or Proceſs, which is not deſcrib'd by any Author; it lyes between the *Condyli*, from it paſſes a Ligament, which joins it to the firſt *Vertebra* of the Neck. *A ſixth Proceſs, not deſcrib'd by any Author.*

It has also several small Prominences towards its *Basis* on the outside, some Tendons being inserted there.

Third and fourth, Ossa Sincipitis.

Third and fourth are the *Ossa Sincipitis, vel Parietaria*, because alike, or forming the Walls of the *Cranium*, as it were; they are the thinnest Bones of the Head, are join'd by the Coronal Suture to the *Os Frontis*, to the *Occiput* by the Lambdoidal, to the *Ossa Temporum* by the *Squamosæ*, and to one another by the *Sagittalis*: They are very smooth on their outside, but somewhat unequal within, having many small *Sulci*, or Furrows, for the reception of the Vessels of the *Dura Mater*; they are thinnest towards the Sutures, as are all Bones of the *Cranium*; these Furrows are thus caus'd, while the Skull is Membranous, the Vessels by their Pulsation make themselves these Furrows.

Sulci.

How caus'd.

Figure.

These Bones are of a Quadrangular Figure.

Bregma, what.

Anatomists call that the *Bregma* of the Head, where these two Bones are united together by the Sagittal Suture, towards the Coronal Bone.

The

The fifth and sixth Bones are call'd *Ossa Temporum*, so call'd *à Temporibus*, because as a Man grows old, the Hairs on the Temples whiten the soonest; they lye on the sides of the Skull, being join'd above by the Squamous Sutures to the *Ossa Parietaria*, before to the Process of the first Bone of the upper Jaw, below to the Sphenoidal Bone, and behind to the *Os Occipitis*; their superior part is smooth, thin, and semicircular, so sometimes call'd *Ossa Squamosa*; their inferior thick, and hard, and call'd *Ossa Petrosa*. *Fifth and sixth*, Ossa Temporum. Ossa Squamosa & Petrosa.

Their Parts to be consider'd, are Sinusses, Processes, and Holes. *Sinusses.*

These Bones have two Sinusses each; the first is large, and lin'd with a Cartilaginous Substance, plac'd between the *Meatus Auditorius*, and its long Process, which makes up part of the *Os Jugale*, call'd *Sinus Glenoides*, and receives one of the Processes of the lower Jaw, call'd *Condylus*; the other two are less, and lye on the inside of the aforesaid long Process. Glenoides.

Each Bone has four Processes, three External, and one Internal. *Processes.*

Styloides. The First is call'd *Styloides*, being ſlender, ſharp, and long; ſome take it to be an Appendix only; in Infants it's Cartilaginous; thoſe Animals which want theſe Proceſſes, their *Os Hyoides* have a double Horn, or Proceſs which ſupplies its place, many Muſcles ariſe from it.

Maſtoides. Secondly, *Maſtoideus*, or *Mamillaris*, becauſe like a Cow's Teat; 'tis blunt, thick, and ſhort, hollow within, plac'd at the bottom of the Auditory paſſage.

Jugalis. Thirdly, *Proceſſus Jugalis vel Zygomaticus*, very long, ſomewhat broad and curved, it's thin, ariſing a little from the outſide of the *Sinus Glenoides*, and meeting with another long Proceſs belonging to the firſt Bone of the *Maxilla ſuperior*, are join'd together by an oblique Suture, and make up the *Os Jugale*, or Bridge.

Petroſus. Fourthly, The Internal Protuberance is call'd *Petroſus*, from its hardneſs, or *Auditorius*; it's ſomewhat long, and jets out towards the inner *Baſis* of the Skull, or *Os Sphenoides*; it's hollow, and contains the Inſtruments

ments of Hearing: It has four little Bones within its Cavity. *Four small Bones of the Ear.*

1. *Incus*, or the Anvil.
2. *Malleus*, the Hammer.
3. *Stapes*, the Stirrup.
4. *Os Orbiculare*, which lyes just on the top of the *Stapes*.

These Bones are as big and perfect at the Birth, as in Adults; they are Articulated after this manner, the *Apophisis* of the *Malleus* is fastned to the *Tympanum*, and Articulated by its Head in the Cavity of the *Incus*; this *Incus* has two Feet, the shortest of which is plac'd on the *Tympanum*, and the longer on the *Stapes*, on which lyes the *Os Orbiculare*. *Manner of Connexion.*

These Bones have many *Foramina* each. Foramina.

The First is External, and call'd *Foramen Auditorium, seu Meatus Auditorius*, by which the Sound enters to the Organs of Hearing. Meatus Auditorius.

Its Second, Is narrow, short, and oblique, by which the Jugular Vein enters the inner Cavity of this passage.

The Third, Is between the Styloid and Maſtoid Proceſs, and ends in that which goes from the Ear to the Mouth.

Common Bones, three. The common Bones are three.

Os Sphenoides. 1. *Os Sphenoides, Baſilare, vel Cuneiforme*, ſome call it *Polyforme*, from its ſtrange Figure; it's not call'd *Cuneiforme*, as if it were like a Wedge, but by reaſon it's ſeated between the Bones of the Skull and upper Jaw; in Infants it conſiſts of two or three Bones; it's very thick at its *Baſis*, but thin towards the Temples. It's join'd to, or touches all the Bones almoſt of the *Cranium*, and ſome of the Bones of the upper Jaw, to which it's faſtned by the Sphenoid Suture.

Its Parts to be conſider'd, are either Proceſſes, Sinuſſes, or *Foramina*.

Proceſſes. It has eight Proceſſes, four Internal, and four External.

Clinoides. The Internal are call'd *Clinoides*, they reſembling the Feet of a Bed; theſe with the depreſt *Sinus* in the middle, make up the *Sella Turcica*, being like the Seat of a War-ſaddle, on which

Sella Turcica.

which lyes the *Glandula Pituitaria.*

Two of the External are call'd *Pterigoidei, ſeu Aliformes*, or the Bats Wings, being like the Wings of a Bat; the other two have no Name. Pterigoidei.

The Sinuſſes are many. It has one in each Proceſs, call'd *Pteregoides*, to give way to the *Muſculi Pterygoidei Interni:* It has alſo a very large one in the middle of the *Sella Turcica*, to receive the *Glandula Pituitaria.* Sinuſſes. Pteregoides.

Within this Bone lyes a true *Sinus*, call'd *Baſilaris*, which have the ſame Glands, and ſeparate the ſame Juice, as the *Sinus Frontalis*, and has the ſame uſe. Baſilaris.

The *Foramina*, are either Common, or Proper. Foramina.

The Common are thoſe which lye between it and the *Oſſa Petroſa*, through which the Jugulars paſs; the proper are twelve, ſix on each ſide; the firſt pair is call'd *Tranſcolatores*, which ſerve as a diſcharge to the *Glandula Pituitaria*; the ſecond *Foramina Optica*, by which paſſes the Optick Nerves; the third *Motoria*, by which paſſes Tranſcolatores. Optica. Motoria.

passes the Motory Nerves; the fourth call'd *Crotophites*; the fifth *Gustatoria*, by which the Tasting Nerves pass; the sixth call'd *Carotides*, by which the Carotid Arteries pass.

Crotophites. Gustatoria. Carotides.

Os Cribriforme.

The second Common Bone is call'd *Os Cribriforme*, being perforated like a Seive, the Fibrils of the Olfactory Nerves pass through these Holes; it's seated at the middle of the *Basis* of the Forehead, to which it's join'd by *Harmonia*; it's also join'd to the two Bones of the upper Jaw, and behind to the *Os Sphenoides*.

Crista Galli.

On its inside it has an almost Triangular Process, call'd *Crista Galli*, the Coxcomb; it arises just where the Process of the *Sinus Frontalis* ends, and reaches about half way in the middle of the Bone; the *Falx* which divides the two *Lobes* of the Brain, is tyed to the point of this Process.

Septum Nasi.

On its outside, just opposite to the *Crista Galli*; it has another very thin, but hard Process, call'd *Septum Nasi*, dividing the Nostrils.

To the *Os Cribriforme* is annex'd two other very fine and thin Bones, one in each Noſtril, call'd *Oſſa Spongioſa*, they be wrapt up, as it were, in many folds, and lin'd with a Membrane made up of the Expanded Fibres of the Olfactory Nerves; ſo that thoſe Creatures, who have more of theſe *Laminæ*, have a more exquiſite ſmell, as Cats, Greyhounds, *&c.* for a Man has not above three or four folds, whereas the above-nam'd Creatures have very many; ſo that it's not difficult to judge of the acuteneſs of the ſmell, from the multiplicity of theſe folds; moſt Anatomiſts conſider them as parts of the *Os Cribriforme*, uſing the one for the other promiſcuouſly; but I think them to be different Bones. Oſſa Spongioſa.

The third Common Bone is call'd *Os Jugale, vel Zygoma*, by ſome the Bridge, or Yoak-bone; it's not one diſtinct Bone, but made up of a long Proceſs of the Temporal Bone, and another of the firſt Bone of the upper Jaw. Os Jugale.

It's

Situation. It's ſituated on the outſide of the Face, under the External *Canthus* of the Eye, there's one on each ſide.

Uſe. Its uſe ſeems as if ordain'd by Nature, for the defence of the Temporal Muſcle which paſſes under it; it alſo gives Origination to the *Muſculi Maſſeteres.*

Demon-

Demonſtration III.

Of the Bones of the Face.

IF the ſtructure of the Bones of the *Cranium* be worthy our Admiration, the Compoſition of the Bones of the Face, which now comes under our view, is no leſs ſurprizing; for although that contains the Brain, which is one of the moſt Noble Parts of the Body; yet the Face where moſt of the Senſes are lodged, and for many Reaſons may be call'd the Image of the Soul, ſince moſt, if not all the Paſſions of the Mind, are fully demonſtrated in the Face, cannot merit leſs, eſpecially in the wonderful ſtructure of the Bones which compoſe it. The Face is alſo the Seat of Beauty, which Charms and Attracts the Eyes of all to behold it; and nothing contributes more to this Beauty than a good Formation, and true Symmetry of the Bones: *Ex. gratia*, if the lower part of

The Bones give Figure, Form, and Beauty to the whole Body.

of the Coronal Bone bunch out too much, it makes them Beetle-brow'd, as we call it: If the Bones of the Noſe be too large, and riſing from the Face, it makes them Hawk-noſed: If the lower Jaw be too ſharp, or pointed, it makes an Out-mouth, and ſo of the reſt; yet we may ſay the ſame of the Bones of the whole Body, they giving, as I have ſaid, Shape and Figure to all; ſo that if they be any way deform'd or unproportioned, that part muſt of neceſſity be disfigured.

Diviſion. The Bones of the Face are divided into thoſe of the upper and lower Jaw.

Bones of the upper Jaw, eleven. The Bones of the ſuperior Jaw are eleven in number, five on each ſide, and an odd one.

1, 2, Oſſa Triangulares. The *Oſſa Triangulares* are big, of a hard and ſolid Subſtance, in Figure triangular, wherefore ſo call'd, plac'd on the lower ſide of the outward *Canthus* of the Eye's Orbit, the middle are advanced out, and riſing, which forms the Balls of the Cheeks: One of their Angular Proceſſes, as I ſaid before, makes up the *Os Jugale*, being join'd with

with the long Proceſs of the Temple-Bone; they alſo make the inferior part of the Orbit of the Eyes, and is united to four Bones, *viz.* the *Coronalis*, *Sphenoides*, *Maxillary*, and *Os Petroſum*.

They have three *Apophiſes* each; one of which makes an eminence, which forms the leſſer Angle of the Eye; the other advancing towards the Noſe, makes the greateſt part of the inferior Lip of the Orbit; the third may well be call'd *Proceſſus Jugalis*, which I have already mentioned. Apophiſis, *three.*

The *Oſſa Lachrimalia*, *ſeu Unguis*, are very little and thin, in ſhape of a Nail of a Man's Hand, ſeated in the great *Canthus* of the Eyes, within the Orbit; there's a ſmall *Foramina*, in each call'd *Lachrimale*, in which the Lachrimal Duct paſſes to the Noſe, alſo through this hole paſſes a Branch of the fifth pair of Nerves, to the inner Membrane of the Noſe. 3, 4, Oſſa Lachrimales. Puncta Lachrimalia.

Theſe Bones are ſo ſmall, that they be eaſily loſt.

The *Oſſa Malæ*, ſome call them *Maxillares*, are the thickeſt, greateſt, and 5, 6, Oſſa Maxillares.

and ſpongieſt of all the Bones of the Face, and makes up the greateſt part of the Cheeks and Palate.

Alveoli. Parts to be conſider'd in theſe Bones, are firſt, many deep Cavities which are in their lower edge, call'd *Alveoli*, or Sockets, in which the Teeth are faſtned: Secondly, each has an Internal *Sinus*, which is lin'd with the ſame ſort of Glandulous Membrane, as the *Sinus Frontalis*, and of the ſame uſe, and is call'd *Sinus Maxillare*. There's alſo another long one, which runs along over the Roots of the Teeth, in which the Veſſels paſs which ſerve for the Nouriſhment of the Teeth.

Sinus Maxillare.

7, 8, Oſſa Nafi. The *Oſſa Naſi* are two long, hard, and ſomewhat thick Bones, of a Pyramidal Figure each, being join'd, they make up the bony or ſuperior part of the Noſe; their lower Extrmities are ſomewhat unequal, for the more ſtrong Connexion of the Cartilages of the Noſe with it; they are join'd together by *Harmonia*.

9, 10, Oſſa Palati. The laſt pair are call'd *Oſſa Palati*, are very broad, but thin, and being join'd by *Harmonia*, make up the Roof of

of the Mouth; they are join'd to the *Ossa Maxillares* forwardly, and backwardly, sideways to the Pterygoid Apophisis, by the Sphenoidal Suture: Each Bone has a hole forwardly, call'd *Foramen Gustativum.*

The eleventh Bone of the upper Jaw is call'd *Vomer*, by reason the Antients say it resembles a Plough-share; it's situated in the middle over the Palate, edgeways, and is, as it were, a sort of *Septum*, dividing the interior part of the Nostrils. 11. Os Vomer.

Before I pass to the lower Jaw, 'twill not be amiss to give a Description of the Orbits of the Eyes; they are two great Cavities plac'd at the inferior part of the *Os Frontis*, which serve as Habitations to the Eyes, and to defend them against all Injuries; their external part is quite round, but internally they grow Pyramidal, having at their bottom many perforations for Vessels, *&c.* Orbita Oculorum.

Each Orbit is made up of part of six different Bones, which altogether compose its Cavity. *Each Orbit made up of six Bones.*

Five of which are Common, and one Proper, which is call'd, as I have already demonstrated, *Os Unguis vel Lachrimale*: Of the Common, three belong to the *Cranium*, and two to the Face; the first of those of the *Cranium*, is the Coronal, which forms the superior part; the second is the Ethmoidal Bone, which forms part of the internal side next the Nose; the third is the Sphenoidal, which makes up part of the internal Cavity; the two of the Face compose all its lower part, the *Os Triangulare* forming that part towards the lesser *Canthus*, and the *Maxillare*, that next the greater.

Inferior Jaw

The lower Jaw is but one continued Bone in Adults, but in young Bodies is compos'd of two join'd together in the fore-part, by *Synchondrosis*; they unite, and become one about the seventh Year, of a somewhat Circular Figure, or rather like the Greek Letter *U*, smooth and polished without, but a little rough within, several Muscles being inserted, and arising from thence.

This

This in all Creatures is only moveable, except as some affirm in the Crocodile, who moves the upper only.

The Parts to be consider'd in this Bone, are its Processes, *Foramina*, and *Alveoli*.

It has two large Processes at each end, the first call'd *Condiloides vel Articularis*, it's received into the *Sinus* of the *Os Petrosum*, and fastned there by a strong Membranous Ligament; the motion of the Jaw depends on this Articulation; the other is call'd *Corone*, which from a large *Basis* ends in a sharp point; it lyes under the *Os Jugale*, the Tendon of the *Musculus Temporalis* is inserted into it; these Processes are in the superior part of the Bone. In its inferior part, just where it begins to turn up on each side, are its Angles, to whose outward part the Masseter Muscles are inserted, and the *Pterygoidei* to the interior. Processes. Condiloides. Corone.

This Bone is somewhat hollow within, containing a Medullar Juice.

It has four *Foramina*, two of which are at the Roots of the Processes in the inside, in which a Branch of the fifth Foramina.

pair of Nerves, together with the ſanguifying Veſſels enter, and paſs under the Roots of the Teeth, diſtributing Branches to each as they paſs; the other two are in the fore-part of the Chin, out of which come two Twigs of the aforeſaid Nerve, which are ſpent on the Muſcles and Skin of the lower Jaw. It has alſo its *Alveoli*, or Sockets for the Teeth, as the upper Jaw.

Alveoli.

Uſes. The Uſes of the lower Jaw, beſides its adding to the Beauty of the Face, is to help Maſtication, and ſerves to form the Voice.

Teeth. The Teeth are the hardeſt of all the Bones of the Body, having a peculiar *Cortex*, are ſmooth, and fix'd in the *Alveoli* of the Jaws, by *Gomphoſis*.

Number. They are in number about Thirty-two, of three Ranks or Orders.

Inciſores. 1. The *Inciſores*, or Cutters, four in each Jaw plac'd in the fore-part, and have commonly but one Phange or Root; they are alſo call'd by ſome *Riſores*, they appearing when we laugh.

2. *Canini*,

2. *Canini*, or Dog-teeth, by ſome the Eye-teeth, two in each Jaw, one on each ſide the *Inciſores*; they have ſometimes two Roots, but ſtrong, and crooked. Canini 4.

3. The laſt are call'd *Molares*, or Grinders, in number about twenty, five on each ſide the *Canini*, and have two or three Phangs. Molares.

The Teeth are not perfected all at once, nor appear before a certain time, when they force their way through the Jaws and Gums; yet there are Obſervations of ſome who have been Born with Teeth; the firſt that appear in Children, are for the moſt part the ſuperior Inciſives, which is ſometimes ſooner, ſometimes later, but generally about the ſeventh, eighth, or ninth Month; then in time come the *Canini*, and laſtly the *Molares*: When the Teeth come to about the number of twenty, there appears no more till about the ſeventh Year, about which time there appears four more: At fourteen there comes four more, and towards the twentieth Year the laſt four, which are call'd Teeth of

Wiſdom, becauſe they come at an Age, when we ought to be Wiſe and Serious.

The firſt twenty Teeth are call'd Milk-teeth, which fall or ſhed about the ſeventh Year, and new ones come in their places.

I have ſeen ſome who have had new Teeth, when they have been upwards of Sixty Years, but this is not very uſual.

Uſes. The Teeth have ſeveral Uſes; firſt, they ſerve for Maſtication, which is its chief, the Teeth being as ſo many Mill ſtones which bruiſe and grinde the Aliment, the *Inciſores* cut the Morſel, and the *Molares* grinde it. Secondly, to help Articulation of the Voice, for we ſee thoſe that loſe their Teeth, eſpecially the *Inciſores*, do not ſpeak plain, but liſp, as we call it; they are alſo Ornamental.

Since we are demonſtrating the Bones of the Head, it will not be amiſs to mention the Bone which is at the Root of the Tongue, being united only by Muſcles; it's call'd *Os Hyoides*, or *Ypſiloides*, by reaſon it's like the Greek *Υ*.

It consists of two parts, the Body and Horns which receive the *Epiglottis*.

The principal Use of this Bone, is not to support the Tongue, as some pretend, but rather to facilitate the entrance of Air into the *Trachea Arteria*, also of the Aliments into the *Oesophagus*; many Muscles also are inserted into this Bone. *Use.*

The Bones of the *Cranium* being join'd together, there are many *Foramina* or Holes, through which Vessels pass and repass; to begin then in order, these appear first, and are commonly by pairs. *Foramina in the whole Cranium.*

1. There's a Hole which lyes between the *Crista Galli*, and the Process of the *Sinus Frontalis*; it's a single Hole, and mentioned by no Author as I find: It may well be call'd *Foramen Nasale, vel Crista Galli*; through this Hole a Vessel passes from the *Sinus Longitudinalis* of the *Dura Mater* to the Nose, where it becomes double, one to each Nostril; this is the way how in great Commotions of the Brain, *Foramen, Crista Galli.*

the Blood ſometimes ſtreams out, and that with violence, the Veſſel being then more turgid.

Foramina Ethmoides

2. The *Foramina* in the *Cribriforme* Bone, for the paſſage of the Olfactory Nerves, and may be call'd *Foramina Ethmoides.*

Foramina Opticorum

3. The *Foramina Opticorum Nervorum*, number two.

Foramina Motorii.

4. Two for the *Nervi Motorii*, and other Veſſels, they are very large long Holes.

Foramina Temp.

5. Two call'd the *Crotophite*, or Temporal Holes, through which paſſes two Branches of the fifth pair of Nerves, to the Temples.

Foramina Carotidum

6. Two for the *Arteriæ Carotides*, which lye juſt by the ſides of the lower parts of the *Sella Turcica.*

Foramina Duræ Matris.

7. Two ſmall ones, one on each ſide the Carotide Holes, call'd *Foramina Duræ Matris.*

Foramina Auditoria.

8. Two for the Auditory Nerves, which paſs into the *Antra Auditoria.*

Foramina Jugul.

9. Two for the Jugular Veins.

Foramina Linguales.

10. Two call'd *Linguales*, through which paſſes Veſſels to the Tongue.

11. Two

11. Two more for the Cervical Arteries, and alſo for the *exit* of ſome Nerves of the fifth pair. Foramina Nervor. paris 5.

12. Laſtly, the great one, call'd *Foramen Medullare*, for the paſſage of the Spinal Marrow. Foramen Medullare.

All theſe Holes are in the *Baſis* of the Skull, or Internal Part.

There are alſo ſeveral *Foramina*, of great uſe in the External Part.

1. Are two *Foramina*, or Holes, one by the edge of the orbit of each Eye, call'd *Orbicularia*, through which paſſes a Branch of the fifth pair of Nerves, to the Lips. Foramina Orbicularia.

2. The *Foramina ſeu puncta Lachrimalia*, in the Lachrimal Bones through which the Tears paſs into the Noſe. Foramina Lachrimalia.

3. The *Foramina Palati*, they are plac'd in the fore-part of the Roof of the Mouth next the Teeth, the thinneſt *Mucus* of the Noſe is convey'd through theſe two Holes. Foramina Palati.

4. Two in the back part of the Palate, through which Branches of the fifth Foramina Alia.

fifth pair of Nerves pass to the Palate.

As for the *Foramina* of the lower Jaw, I have already mentioned them in the Description of that Bone.

Demon-

Demonſtration IV.

Of the Bones of the Trunk.

THE next part of the Skeleton that is to be Demonſtrated, is the Trunk, which we ſhall divide into Three Parts, as the Back or **Spine**, Ribs and Breaſt; and laſtly, the Hips, or *Oſſa Innominata*. *Diviſion, threefold.*

The Back, or rather Spine, is compoſed of many Bones, call'd *Vertebræ*, or Spondils, all which being join'd or united together, may not unfitly be term'd a Pyramid of Bones; but before we Treat of them in particular, it will be requiſite to ſay ſomething of the Spine in General, in which ſeveral Things are to be taken notice of. Vertebræ. *Of the Spine in General.*

1. All the Bones, from the firſt of the Neck, to the very Extremity of the *Coccygis*, are call'd the Spine, I ſuppoſe from the acute Proceſſes each *Vertebræ* have, call'd *Spinales*. *Denomination.*

2. The

Figure. 2. The figure or ſhape of the Spine, is of great Conſideration, for if you look on its Anterior or Poſterior Parts, it appears ſtreight; but if you look on its Lateral Parts, its curved in and out: Firſt, the Spondils of the Neck bend inwards, for the better ſupport of the *Oeſophagus*, alſo to ſuſtain the Head in an *Equilibrium*, then the *Vertebræ* of the Back jet themſelves outward, to augment the Capacity of the *Thorax*, that the Heart and Lungs may have a larger room to play in; towards the Loins again, they bend inwards, not only to defend the great Veſſels which lye on them, but alſo to Counterballance the better the weight of the Body; the *Os Sacrum* bends outward, that the *Pelvis* be inlarged to contain the Bladder, Womb in Women, and *Inteſtinum Rectum*; and laſtly, the *Os Coccygis* bends inwards, that it might not be offended when we ſit down, alſo that the *Inteſtinum Rectum* be tyed to it.

Bodies of the Vertebræ. The third Thing to be obſerved in General, or Common to all, is that the Bodies of each *Vertebra* are of a ſpongy

ſpongy Subſtance, made up of many irregular bony Threads, containing a Medullar Juice, of a Convex Figure forwards, but Concave backwards, and plain above and below, being only join'd with Cartilages, which makes them Contiguous, & unites them there, which gives them a more eaſie motion, the Body alſo of each *Vertebra* gradually increaſes in bulk, till to the very *Os Sacrum*; for it's reaſonable that thoſe which ſupport, ſhould be larger than thoſe which are ſupported, and at the ſame time as the *Spinalis Medulla* paſſes down, it grows leſs, loſing of its bulk as the Nerves paſs from it, and the *Foramina Medullares* of each *Vertebra* conſequently leſs.

Five things to be conſider'd in the Vertebra. Foramina Spinales.

4. Each *Vertebra* have five Things to be conſider'd, which belong to all; 1. Each, as I have ſaid, have a Body. 2. Each have a great *Foramina*, through which the *Spinalis Medulla* paſſes, even to the very *Os Sacrum*, which may well be call'd *Foramina Spinalia vel Medullaria*; theſe holes are largeſt in the *Vertebræ* of the Neck, and ſo leſſen as they deſcend, ſeveral Nerves,

Nerves, as I have hinted before, paſſing from the Spinal Marrow, ſo leſſens them; but the Bodies grow larger to ſuſtain the reſt, the Spinal Marrow reaches no further than the laſt *Vertebra* of the Back, where it begins to divide into many ſmall Filaments, which are ſubdivided into ſmaller in the *Os Sacrum*, where it's call'd *Cauda Equina*, or the Horſe-tail. 3. They have each ſeven Proceſſes, four oblique ones, two ſuperior, and two inferior, two tranſverſe, and an odd one call'd *Acutus*, *vel Spinatus*, by ſome *Poſterior*. 4. They are join'd one to another in their oblique Proceſſes by *Ginglimus*, and by *Synchondroſis* in their Bodies; alſo on their inſide, they are lin'd with a ſtrong ſmooth Membrane, which reaches from the firſt, to the *Os Sacrum*. 5. They have many Sinuſſes, but the moſt remarkable, are thoſe under their oblique Proceſſes, which being united to others above the aforeſaid Proceſſes of other *Vertebræ*, make certain *Foramina*, through which the Nerves of the Spinal Marrow paſſes, as alſo many Blood-veſſels to and

Cauda Equina, quid ?

Seven Proceſſes in each Vertebra.

Conjunction.

and from the *Spinalis Medulla*; they may be aptly enough call'd *Foramina Nervina*. Foramina Nervina.

We come now to Treat of each *Vertebra* in particular; the *Vertebræ* are in number twenty-five; that is, seven of the Neck, twelve of the Back, five of the Loins, and one of the *Os Sacrum*, to which is annex'd the *Ossa Coccygis*. *Of the* Vertebræ *in particular.* *Number* 25.

The Neck has seven. *Seven of the Neck.*

The first is call'd *Atlas*, by reason it sustains the Head, as *Atlas* was supposed to do the Heavens; its transverse Processes, as also all the other of the Neck, are not so long as those of the Back; it's Articulated to the Condiloid Processes of the *Os Occipitis*, by its superior oblique Processes, in which are two *Sinus*'s that receives the aforesaid Condiloid Processes; this Articulation is a sort of double *Arthrodia*, so is only capable of Flexion and Extention; it has very little, or no Body, but within has a small *Sinus* to receive the *Dens* of the second *Vertebra*; this *Sinus* is lin'd with a strong Ligament, which 1. Atlas.

which faſtens the aforeſaid *Dens*, the Spinal Proceſs is a very little blunt knob, but all the other Spines of the Neck are forked, except the laſt. It has a ſmall round Proceſs in its upper part where the Body ſhould be, from which paſſes a ſmall Ligament, to another ſmall round Proceſs between the *Condiloides* of the Occipital Bone, cloſe to the *Foramen Medullare*.

2. Dentata.

The ſecond *Vertebra* is call'd *Dentata, vel Epiſtrophous*, becauſe between its two ſuperior Proceſſes, ſprings another very hard one, call'd *Dens*, being like a little Tooth, which being received into the above-mentioned *Sinus* of the firſt *Vertebra*, and encompaſſed with ſtrong Membranous Ligaments; this moves in the *Atlas* as an *Axis*, as the Flexion and Extention depend on the firſt *Vertebra* with the Head; the Circular Motion depends on this and the firſt: When a Luxation happens here, the Neck is ſaid to be broke.

The five following have no particular Name, and are much like one another, only increaſing a little in bigneſs, and the Spinal Proceſs of the laſt is not

not fork'd, beginning to grow ſomewhat like thoſe of the Back; the tranſverſe Proceſſes, and ſpinous ones, are ſomewhat rough, for the better inſertion of many Muſcles, which are faſtned there.

All the *Vertebræ* of the Neck, have two ſmall *Foramina* each, which lye in the Head of the tranſverſe Proceſſes, ſerving for the paſſage of the Vertebral Arteries. Foramina Vertebrarum Colli.

Their oblique Proceſſes have this obſervable in them, their ſuperior ones are ſomewhat hollowiſh, to receive the inferior Convex ones, that the motion of the Neck be freer.

The Back has twelve *Vertebræ*; yet I once ſaw a Skeleton that had thirteen, and thirteen Ribs; they are bigger than thoſe of the Neck, but leſs than thoſe of the Loins; their Spinal Proceſſes are not fork'd but pointed, and lye one over another; the tranſverſe are ſhort, but large, and blunt, and have a Cavity to receive the Heads of the Ribs; the oblique are ſharp, and ſmooth, and ſo conſequently little motion, theſe are call'd Vertebræ Coſtales. Back 12.

the Coſtal *Vertebræ*; the eleventh *Vertebra* has its ſpinal Proceſs, not lying over the other, as thoſe above it.

The laſt *Vertebra* of the Back has this to be obſerved in it; it receives none, but is received, both by the eleventh of the Back, and firſt of the Loins; on this depends the greateſt motion of the Back.

Loins 5. The five of the Loins are larger than thoſe of the Back, and their Articulation looſer, their tranſverſe Proceſſes are more long and fine than thoſe of the Back, which ſerve as Ribs, as it were, yet the firſt and fifth are ſhorter than the reſt; their *Foramina Nervina* are excavated only out of the lower *Vertebra*, whereas thoſe of the Back equally out of both, but thoſe of the Neck only out of the ſuperior; their poſterior Spines, are ſhort, blunt and thick, a little broad, and turn a little upwards, that the bending of the Body be no way hindred; and whereas in the other *Vertebræ*, the upper oblique Proceſſes receive the lower, in theſe the lower receive the upper.

N. B.

The

The firſt of theſe *Vertebræ* is call'd *Renalis*, the Kidneys being lodged at the ſide of it; the other four have no particular Name. Renalis.

The *Os Sacrum*, or holy Bone, ſo call'd, as ſome think, becauſe the Antients uſed to ſave this part as Sacred in Sacrifices; but I think rather from Ἱερον, as the Greeks call it, which ſignifies *Magnum*, as well as *Sacrum*, it being the biggeſt Bone of all the Spine. It's immoveable, and ſerves as a *Baſis* or Pedeſtal to the whole Spine; it's of a ſomewhat triangular Figure, with the point downwards; it's Concavous within, which helps to form the *Pelvis*, alſo ſmooth; behind it's *Convex*, and unequal, many Muſcles ariſing, and being inſerted here, it ſeems as if it were compoſed of five or ſix Bones, (as indeed it is in Infants) its Oſſification beginning at ſo many points, but its edges, or rather, if you will, its tranſverſe Proceſſes look but like one continued Bone, as it is; the *Foramen Spinale* towards its lower part is very ſmall; its *Foramina Nervina* are before and Os Sacrum.

behind, and not on the ſides, as in the other *Vertebræ*; its ſpinal Proceſſes are very ſmall, the laſt being only a ſmall round Protuberance, its oblique Proceſſes are hardly viſible, except the ſuperior ones; the parts which compoſe the *Os Sacrum*, are plac'd in the number of the *Vertebræ*, not by reaſon of their uſe, but becauſe of their reſemblance, for otherwiſe they are immoveable: The *Os Sacrum* may be ſaid to be divided into five *Vertebræ* of different bigneſs, whereof the ſuperior is biggeſt, they diminiſhing as they deſcend, the laſt being the leaſt; theſe ſeperate eaſily in Infants, by reaſon the Cartilages which unite them, are not fully oſſified; but in Adults, they all make up but one intire Bone.

Uſes. This Bone ſeems to have ſeveral Uſes, the firſt is, as I have already remark'd, to ſerve as a Foundation to the whole Spine. Secondly, to help to contain the parts of the *Hypogaſtrium*, by forming a Cavity, as I have ſaid. The third to defend them; the fourth to Articulate the Bones of the

Hips;

Hips; the fifth to give Origin and Inſertion to many Muſcles.

To the end of this Bone are annex'd two or three little Bones call'd *Oſſa Coccygis*, the Cuckow's Beak; ſome call them the Rump-bones: They have a ſomewhat looſe Articulation, and tyed by Cartilages one to another, the laſt is the ſmalleſt: They have this looſe Articulation, that they may give way to the *Fœtus* in the Birth, therefore in Women theſe Bones are always more bent backwards than in Men; they end in a Cartilaginous point, to which is tyed the *Inteſtinum Rectum*; they have nothing more material in them, having neither Proceſs nor Cavity. *Oſſa Coccygis.*

We ſhall now proceed to the Bones of the Breaſt and Ribs, which is the ſecond Diviſion of the Trunk. *Bones of the Breaſt.*

The Ribs are twenty-four in number, twelve on each ſide; to be well-inſtructed in all which concerns the Ribs, we muſt obſerve ſeveral things, as their Subſtance, Figure, Connexions, Parts, Diviſion and Uſe, of all which in order. *Ribs* 24.

Substance of the Ribs. The substance of the Ribs is partly Bony, and partly Cartilaginous, that end next the *Vertebra*, being of a harder and more solid and thick substance than that towards the *Sternon*, which is flattish, so less capable of being broke; for that end towards the *Sternon* being more spongy in substance, all the Ribs end towards the Breast by Cartilages, increasing in length as the Ribs descend; and those Cartilages of the superior Ribs, are harder than those of the inferior; sometimes these Cartilages grow bony in Old People, so that they cannot be separated by a Knife.

Figure. The Ribs have a sort of Semicircular Figure, making a sort of Arch; when two are together, they make a kind of a true Circle, Concave inwardly, to form the Capacity of the *Thorax*, and to contain the Lungs and Heart, and Convex outwardly, to resist outward force; the farther they depart from the *Sternon*, the more round they are in their own Body; they are not equally big, for the superior are shorter, the middle biggest of all,

all, and the inferior one leaſt of all; their upper ſides are thick, blunt, and broad; one edge is call'd the interior, the other the exterior Lip; their under edges are ſharp, having in their inſide a long *Sinus*, or Furrow, in which lye the Intercoſtal Veſſels.

The Ribs are Articulated by their Extremities, both to the *Vertebræ* of the *Thorax*, and *Sternon*; that Articulation with the Back is moveable, the other not; the long Head of each Rib is Articulated by a ſingle *Arthrodia*; it has a ſmall Protuberance cloathed with a Cartilage, which head is received into a *Sinus* of the tranſverſe Proceſs of the *Vertebra*; 'tis this Proceſs which ſupports the Ribs, and hinders them from coming lower in Expiration: You muſt obſerve, that the back-part of every Rib is higher than the fore-part, till the Cartilage be join'd, which turning a little up, makes the two ends of an equal height, ſo that by the riſing of the Ribs, the Breaſt is enlarged. We muſt alſo take notice, that almoſt all the Ribs have a Communication with the

Articulation.

N. B.

Sternon, either directly or indirectly; that is, the ſuperior ones are by a direct inſertion, but the lower by an indirect, which is by Cartilages adhering to the ſuperior.

All the Ribs make a ſort of Angle by their Cartilages towards the *Sternon*, which ſerves to increaſe the Spring of the Cartilages, that the Ribs be brought down again, having been rais'd in Inſpiration. It ſometimes happens, though ſeldom, that theſe Cartilages are oſſified, which occaſions an Incurable *Aſthma*; the laſt, or loweſt Rib in Man, have no Cartilage as the reſt; the lower the Ribs are, the longeſt and more movable, becauſe Reſpiration in Man is downwards, but in Birds upwards.

N. B.

Ribs of two ſorts.

The Ribs are commonly divided in two ſorts, as true or falſe, but I think they may well be all accounted true, except the laſt, (being join'd mediate or immediately to the *Sternon* by Cartilages) which has none, ſo only may be term'd a falſe Rib; however it being a common received Opinion, I ſhall

ſhall make the diviſion: the long or true are ſeven on each ſide, and are the ſuperior ones; the firſt of which has no motion at all, it being as a prop for all the reſt, but as they deſcend they increaſe in motion; they are Articulated to the *Vertebræ* of the Back by a ſort of double *Arthrodia*, which makes a *Ginglimus*, and to the *Sternon* by *Synarthroſis*, the three loweſt of which are by ſome call'd the Pectoral Ribs. *True* 14. Coſtæ Pectorales.

The falſe or baſtard are five on each ſide, the four uppermoſt of which have at their Extremities towards the *Sternon* long Cartilages, bending upwards, and cleaving only one to another; that is, the loweſt to the ſuperior, ſo not directly united to the *Sternon*, as the firſt ſeven are; which was the Reaſon the Antients gave them the Name of Spurious: The laſt has no Cartilage at its end, the edge of the *Diaphragme* being tyed to it. *Falſe*, 10.

All the Ribs, as I have already demonſtrated, are received both into the tranſverſe Proceſſes, and body of the *Vertebræ*; except the two or three laſt,

laſt, which are only received into the body of the *Vertebræ*.

Uſe. The Ribs are to defend the Heart and Lungs, *&c.* from all ſorts of external Injuries, ſo that they be not preſt, but have free motion, which were it not bony, would be always in danger of being offended; they alſo ſerve to ſuſtain the Reſpiratory Muſcles.

Uſe of the Cartilages. The Cartilages of the Ribs have this Uſe, that is, when the Ribs are drawn ſomething upwards in Inſpiration, they draw them down again with a ſort of Spring; for all Cartilaginous Bodies are indued with a ſort of Elaſticity, ſo that they always recover their firſt Figure.

☞ This Mechaniſm is obſerved in various Animals, for in Birds the *Sternon* is immovable, becauſe the flying-Muſcles ariſe from thence; ſo that if the *Sternon* had any thing to do in Reſpiration, it would be hinder'd; therefore Nature has contrived another Artifice, which is this, between every Rib there's a little Bone, plac'd ſomewhat obliquely, ſo that if one moves,

moves, the other follow by consent.

All these Birds have no Diaphragm, but instead thereof two Bladders, which reach to the bottom of their Bellies, they serve for the *Diaphragma*, and also help to keep them suspended in the Air: These Creatures which have a *Diaphragma*, breathe downwards, but Birds, *&c.* which have none, breathe upwards.

In Amphibious Creatures, as the Tortoise, *&c.* their Shell is in place of Ribs, and Frogs have only one Rib on a side, to defend the Lungs.

The Breast-bone is call'd *Sternon*, or *Os Pectoris*, situated in the middle of the Anterior part of the Breast, composed of two or three Bones, having the Productions of the Cartilages of the Ribs inserted into their sides, of a reddish fungous Substance.

Sternon *made up of* three Bones.

To consider it well, it must be examined at two different times; for in Infants it's almost all Cartilaginous, except the first Bone where the *Clavicula* are fastned. In Old People I have seen it all ossified, except the first with

with the ſecond at its juncture, but in thoſe of Middle Age, partly Bony, and partly Cartilaginous, the ſuperior Bone always oſſifies firſt, and the inferior laſt. In the *Sternon* of Infants you may perceive ſeven or eight Junctures, as if ſo many Bones, but in the ſeventh or eighth Year, they uniting, make up but three or four at moſt.

Firſt Bone. The firſt or ſuperior Bone of the *Sternon*, is more thick and ſolid than the reſt, made in the ſhape of a Creſcent almoſt, at each ſide of its ſuperior part, it has a *Sinus* to receive the head of the *Clavicula*; at its top it has a Lu-
Jugulum. nated *Sinus* call'd *Jugulum*; it has alſo a ſmall long *Sinus* on its inſide, to give way to the *Aſpera Arteria*: It's immovable.

Second Bone. The ſecond Bone is narrower, longer and thinner, having at its ſides many Sinoſities, to receive the Cartilages of the Ribs.

Third Bone. The third Bone is leſs than the ſecond, but broader, at the lower end of which is annex'd a Cartilage call'd *Xiphoides, vel Mucroconita, vel Enſiformis,*

formis, the Sword-like Cartilage; it's of a Triangular Figure, it ſerves to defend the ſuperior Orifice of the Stomach: It's this place which is call'd *Scrobiculus Cordis*, the Heart-pit; the *Diaphragma* is alſo faſtned to it; a ſtrong Ligament of the Liver, call'd *Suſpenſorium*, is tyed to it, for in Inſpiration the Ribs being drawn upwards, then the Liver by its weight keeps this from moving, and when in Exſpiration the Ribs aſſume their former Figure, this by its Cartilaginous Spring aſſumes his alſo. Cartilago Enſiformis

The Uſes of the *Sternon* are, firſt, to unite the Ribs, that their motion may be all at one and the ſame time, alſo to receive the *Clavicula*: Laſtly, to faſten the *Mediaſtinum*, which is a Membrane that divides the Breaſt in two. *Uſes of the* Sternon.

The third part that compoſe the Trunk, are call'd *Oſſa Innominata*, becauſe of a very ſtrange Figure; they are in number two, one on each ſide of the *Os Sacrum*, having where they are united to it, many Depreſſions and Riſings, for their greater Strength and Con- Oſſa Innominata.

Articulation. Connexion, being Articulated before by *Synchondrosis*, so make up that Cavity call'd the *Pelvis*, which contains the (Womb in Women) Bladder, and *Intestinum Rectum*, with other of the Guts.

Pelvis.

Each consists of three in Children. In Children each Bone consists of three, all of them meeting in that deep Cavity, call'd *Acetabulum*, which receives the head of the *Femer*, but as we grow in Years they all make but one Bone, yet then, for better distinction, nam'd as three, as the *Os Ileum*, *Ischium*, and *Pubis*, of all which in order.

Os Ileum. The *Ileum* is the superior part of the Bone, so call'd, because most part of the *Ileum*-Gut lyes on its Internal Face; from it's External arise the *Musculi Glutei*: It's the biggest of the three, and join'd with the *Os Sacrum*.

Spina Ilei. Things to be consider'd in this Bone, are, first, its Figure, which is Semicircular. Secondly, its top, which is call'd the Ridg, Comb, or Spine, being covered with a Cartilage: Its Internal

ternal Face is Concave, and its Exterior Convex: It has three Protuberances, being rather ſo many parts of the Spine; one forwards, call'd *Spina Anterior Superior*; another below, call'd *Spina Anterior Inferior*, leſs than the former; and a third behind, call'd *Spina Poſterior*. *Three parts of the Spine.*

The *Os Iſchium*, or *Coxendicis*, is the lower part of the *Os Innominatum*, in which is to be conſider'd two parts; firſt, It's Superior, which makes up the greateſt part of the *Cotula*, or *Acetabulum*. Secondly, Its Inferior, or lower part, which we ſit on, which is call'd *Tuberoſitas Iſchii*; it has a Sinuoſity on its inner ſide, where the *Muſculus Obturator Internus* winds about; the Muſcles of the *Penis*, and Elevators of the *Anus*, have their Origin from the Tuberoſity of the *Iſchium*. Os Iſchium. Tuberoſitas.

The *Os Pubis*, or *Pectinis*, by us the Share-bone, is the fore-part of the *Os Innominatum*; it's join'd forwardly to its Fellow by *Synchondroſis*, the hinder part of it forms part of the *Acetabulum*; Os Pubis.

the

the ſuperior part is call'd the Spine, to which the Muſcles of the *Abdomen* are faſtned; where this joins with the *Iſchium* there's a large *Foramen*, call'd *Ovale*, cover'd with very a ſtrong Ligamentous Membrane; above this *Foramen* there's a *Sinus*, by which the Crural Veſſels paſs to the Thigh.

Foramen Ovale Oſſis Pubis.

All theſe Bones being join'd together in their middle, make up that deep Cavity call'd *Acetabulum*, *vel Cotula*, in which the head of the *Os Femoris* enters, which is tipt with a Cartilage, call'd *Supercilium*.

Theſe Bones are more ample and large in Women than Men, and thoſe which have them moſt advanc'd, have the eaſieſt Labour.

Oſſa Pubis, *largeſt in Women.*

The Antients believed, that in Labour the *Oſſa Pubis* ſeparated for the more eaſie Delivery of the Birth, nay, *Bartholinus* is of this Opinion, for he ſays, that in a Woman newly Deliver'd, you may divide them with the back of a Knife; but I preſume it's not ſo, for they ſeparate not the leaſt; 'tis only the *Os Coccygis* which gives way

The Oſſa Pubis *do not ſeparate in Labour.*

way a little by bending backwards, for moſt pain is felt when the *Fœtus* paſſes by the Fundament; yet ſome have a more looſe Articulation of their Bones, and ſo perhaps might bring them into this Error.

Demonſtration IV.

Of the Bones of the Superior Extremities.

I Have Demonſtrated all the Bones which make up the two parts of the Skeleton, there remains now only the third part, which is thoſe of the Extremities.

Extremities, Upper and Lower.

The Extremities, or rather the Limbs, are either Superior, as the Arms; or Inferior, as the Legs.

We will begin with the Superior; but firſt I muſt inform you, that ſince both Extremities are double, I ſhall only ſpeak of them in the ſingular number, for by demonſtrating one ſide, you at the ſame time ſhew the other.

Although there be no part which does not furniſh us with ſome Subject of Admiration, yet we muſt all agree, that the Arm hath as great a ſhare, if not more, than any other; for which reaſon *Ariſtotle* call'd it the Organ of Organs,

Organs, and the Inſtrument of Inſtruments; and ſince Nature has given to all Animals, ſomething particular, either to defend themſelves againſt others, and preſerve themſelves from external Injuries; or elſe to offend; we may ſay then, that Man has received two things preferable to Animals, to wit, Reaſon and Hands, the one for Counſel and Conduct, the other for Execution of our Will; 'tis theſe Hands which gives him the Soveraign Command over all Creatures be he never ſo Cruel, Strong, or Swift; for of what Advantage would all our Reaſon and Conduct be, if we had not Hands to perform what Reaſon dictates: I could ſay much more on this Subject, but that I am here on plain Demonſtration, and not Philoſophizing.

Diviſion. Arm, five parts.

The Arm, generally ſo called, has five parts, as the *Clavicula*, *Scapula*, Shoulder, Arm, and Hand, of all which in due courſe.

Clavicula.

1. The *Clavicula*, which ſome place among the Bones of the Spine, but I

think it rather belongs to thoſe of the Arms, as I ſhall ſhew in its uſe, the whole motion of the Arm depending on this Bone; It's call'd *Clavicula*, I ſuppoſe, being a diminutive from *Clavis* a Key, becauſe the Keys in old time were like an *ſ*; in *Padua* they have ſuch ſort of Keys ſtill, as I am inform'd by thoſe who have been there; it's not ſo crooked in Women as in Men; it's Articulated by one end to the *Acromium* of the *Scapula*, and by the other to the upper part of the firſt Bone of the *Sternon*; by a ſort of *Arthrodia*, yet has but little motion; the more crooked theſe Bones are, the more force and agility has the Arm. It's hollow in the middle, and contains Marrow, as all long Bones, but towards the ends Spongy; that end towards the *Acromium* is not very thick, but rough, and unequal, the end towards the *Sternon* ſmoother: It's alſo here outwardly Convex, but inwardly Concave, to give way to the Veſſels which paſs under it, otherwiſe it would have preſt them; but towards the *Acromium*, Convex inwardly,

Figure.

Articulation.

Subſtance.

wardly, and Concave outwardly, for the more convenient ſituation of the Deltoid Muſcle, which would otherwiſe appear too bulky, and make the Breaſt look deform'd.

They ſerve to uphold the *Scapula* and *Humerus* from falling on the Breaſt, which they do when this Bone happens to be Fractured; the whole motion of the Arm depends alſo on this Bone; for Brutes having no *Claviculæ*, cannot move their Fore-legs ſo readily as a Man, or as ſome Animals which have them, as Monkeys, Squirrels, *&c.* *Uſe.*

2. The *Scapula*, or Shoulder bone, is ſituated on the back-part of the *Thorax*, being only faſtned with Muſcles, (ſo more looſe, that the motion be freer and eaſie) except in its *Acromium* where it's Articulated with the *Clavicula*; it's of a Triangular Figure, whereof two Angles are Poſterior, and one Anterior. Its inward Face is Concave, as well to accommodate it ſelf to the Ribs whereon it lyes, as to contain a Muſcle, but outward Gibbous, thicker on its edges than in the middle, *Scapula.* *Figure.*

middle, being there transparent, and very thin; so that in a *Caries* of that part we cannot expect Exfoliation, no Medullar Glands being there, it's nourished from its sides.

Processes, three. Parts to be consider'd in this Bone, are first, its Processes, which are three, first is a thin, but rising Process, in the middle of its outside, extending all its length, it's call'd the Spine; its Point or Extremity is call'd the *Acromium*, in which is a flattish *Sinus* to receive the *Clavicula*: Some say that this Process is a distinct Bone from the *Scapula*, because in Infants its only Cartilaginous, which ossifying by degrees, makes up but one Bone; the second is less, and plac'd at the superior part of the Neck, which advances above the Head of the Bone of the Arm: It's curved, and call'd *Coracoides*, the Crows-bill, or *Ancyroides*, some call it only *Processus Curvatus*, it strengthens the Articulation of the *Humerus*. The third, or middle one, is call'd *Cervix*, is which in a somewhat flat *Sinus* to receive the head of the *Humerus*, call'd *Glenoides*; the *Humerus* is

Spine.

Acromium

Coracoides Ancyroides.

Cervix.

tyed

tyed to it by a ſtrong, but ſomewhat looſe Ligament; the edges of this *Sinus* is tipt with a Cartilaginous Ligament, which hinders the *Humerus* from being too eaſily Diſlocated; there's alſo a ſtrong Ligament from the *Acromium* to the *Proceſſus Coracoides*, which, together with the *Acromium*, hinders the *Humerus* from being too eaſily Diſlocated upwards, except this Ligament or the *Acromium* be broken.

The edges of this Bone are call'd *Coſta.* Coſta.

It has three Angles, 1. The Inferior. 2. Poſterior. 3. *Cervix*; that part which reaches from the Poſterior to the Inferior Angle, is call'd the *Baſis* of the *Scapula.* Angles, three. Baſis.

It has two notable *Sinuſſes* one on each ſide the Spine, where the *Muſculi Infra*, and *Supra Spinati* lye; the lower *Sinus* is largeſt; in its inſide Concave part lyes the *Muſculus Subſcapularis, vel Immerſus.* Sinuſſes.

The *Scapula* has many Uſes; firſt, it gives Origin to many Muſcles, it faſtens alſo the Arm to the Body, and Uſe.

ſerves to ſupport it, to the end it may have all its motions.

Humerus. The third part of the ſuperior Limb is the *Os Humeri*, or Shoulder-bone, it's the ſtrongeſt and largeſt of all that compoſe the Arm; it's long and round in its fore-part, but ſomewhat flat behind; its ſuperior part is

Articulation. Articulated to the *Cervix* of the *Scapula* by *Arthrodia*; at its lower end with the *Cubitus* by *Ginglimus*; it alſo touches the *Radius* by *Arthrodia.*

Parts to be conſider'd. To examine the parts of the *Humerus*, you muſt conſider its Extremities, and Body.

Body. The Body is long and round, within it contains a Marrow; its Figure is not abſolutely ſtreight, but ſomewhat hollow inwardly, and bunching outwardly, to fortifie it in its Actions; there is obſerved a Line which deſcends and terminates in two Proceſſes, which ſerve to faſten the Muſcles inſerted here.

Superior Extremity. The ſuperior Extremity of the *Humerus* is bigger and more ſpongy than the Inferior; and contains a Medullar Juice; it's call'd the Head, cover'd with

with a Cartilage: It's encompaſſed on all ſides with Ligaments and Membranes, which proceed from the Glenoid Cavity of the *Scapula*; a little below this Head, there's a round part a little ſmaller, call'd the Neck; there's at the hinder part of this end two rough unequal Proceſſes, into which ſeveral Tendons and Ligaments are inſerted; ſo that great Care ought to be had in Wounds, or Ulcers of this Part, leſt you miſtake the Roughneſs for a Carioſity; between theſe inequalities there's a long Slit, or Sciſſure, in which the Tendon of the *Muſculus Biceps* paſſes. *Proceſſes.* *N. B.*

The Inferior Extremity of the *Humerus* is leſs, flatter, and harder than the other; it has three Proceſſes, two whereof are call'd *Condyli*, the Exterior and Interior: The Bone ſeems here to be divided in two parts. The third, or middle Proceſs, is large, and call'd *Trochlea*, the Pully; it has two large Sinuſſes, which receive the Proceſſes of the *Ulna*, to which it's Articulated by *Ginglimus*; the back *Sinus* is large and deep, which receives the *Olecranon*, *Condyli.* *Trochlea.*

Olecranon, but that on its fore-part ſmaller.

Brachium, *two Bones.* The fourth part, or that which is ſtrictly call'd the Arm, is compoſed of two Bones, the biggeſt and longeſt call'd *Ulna*, the leſſer *Radius*; for had this part been made up only of one Bone join'd by *Ginglimus*, we could do nothing elſe but extend and draw up the Arm, and not turn it upwards and downwards, which is perform'd by means of the *Radius*, for which end it's Articulated by *Arthrodia*.

The two Bones are not both of a bigneſs, for which ſome diſtinguiſh them by the Names of *Major* and *Minor Focile*; in their middle they are ſomewhat diſtant the one from the other, for the more Commodious Situation of the Muſcles, Paſſage of the Veſſels, and principally for the Eaſe of Motion.

Ulna. 1. The *Ulna*, or *Cubitus*, ſo call'd, by reaſon it's this Bone which makes the Elbow; it's biggeſt at the ſuperior part, and has two large Proceſſes, that in the back-part is call'd *Olecranon*,

Olecranon. *vel*

vel Ancon, which when the Arm is extended, is received into the large Posterior *Sinus* of the *Trochlea*, so stops the Arm from going further backwards, it's otherwise call'd the Elbow; the other is less, and received into the fore *Sinus* of the *Trochlea*, it stops the Arm from being bent too close forward; below this is another very small Process, into which the Tendon of the *Musculus Biceps* is inserted.

Sinusses. It has two small Sinusses, the Lateral one receiving the Head of the *Radius*, the other is between the two large Processes, and receives the *Trochlea* of the *Humerus*; it may be call'd *Sigmatoides*, because it resembles the Greek Letter *Sigma*.

Three Angles in its Body. At the body, of middle of this Bone, there's observed three Angles, whereof the Inferior is call'd the Spine, and is very streight; the other two are oblique, the one of which is the Anterior Angle, the other Posterior; one side is very smooth and equal, the other pretty rough, some Tendons being inserted there.

The

The Inferior part of this Bone has two Eminencies, and one Cavity; the firſt of the Eminencies is ſeated at the lateral part, and is received by the Glenoid Cavity of the *Radius*: The ſecond is at the very Extremity, and may be call'd *Styloides*, it ſerves to ſtrengthen the Articulation; the Cavity or Sinuoſity is at the end of the Bone, and helps to make the *Arthrodia* with the *Carpus*: This Bone at its ſuperior end receives the *Radius*, but is received by the *Radius* at its lower end.

Styloides.

Radius. The *Radius* is the ſecond Bone of the Arm, (or as ſome call it, the Fore-Arm) ſo call'd, becauſe it reſembles the Spoke of a Wheel; it's Articulated in its ſuperior part, two manner of ways: Firſt, with the External Condyl of the *Humerus*. Secondly, with the *Ulna*, and both by *Arthrodia*: It's likewiſe Articulated two manner of ways in its Inferior part, either with the Bones of the *Carpus* at its Extremity, or with the *Ulna* on its latter part: The *Radius* is ſmalleſt in its ſuperior, but largeſt in its Inferior part.

Articulation.

The

The Things to be obſerved in its Superior part are theſe: Firſt, its Head, which is round and poliſhed, at the end of which is a Glenoid Cavity, which as I have already remark'd, receives the External Condyl of the *Humerus*; the Neck is ſomewhat long. Now this is very obſervable, that the Ligament which comes from the other Bone to join it, is not inſerted in it as in other Bones, but only encompaſſes this Neck as a Ring, ſo that it may turn, for its Prone, and Supine Motions, which had the Ligament been inſerted into it, it could not have done, yet at the ſame time it's ſtrong enough to keep it firm; the whole motion of the Wriſt is perform'd by the *Radius*; the Tuberoſity or Eminence is ſeated juſt below the Neck, and is received into the lateral Superior *Sinus* of the *Ulna*.

Superior part.

Ligamentum Admirabile.

In its middle it has an obtuſe Angle, which ſome call the Spine, which gradually grows bigger as it inclines towards the *Carpus*, different from the *Cubitus*, which diminiſhes: It's in this that we may admire Nature, which

Body.

not

not being able to avoid making these two Bones unequal in their Extremities, has found means to make the Arm equally strong in all parts, by placing the weakest part of one Bone against the strongest of the other.

Inferior part. At its Inferior part many Sinuosities appear, which are as small Gutters, that so the Tendons be not incommoded; it has also a Cavity at its Extremity, which receives one of the Bones of the *Carpus*; at its lower end it has Mastoides. a blunt Process, call'd *Mastoides*: from the Internal Angle of this Bone, there's a long broad Ligamentous Membrane, which unites it to the Internal Angle of the *Ulna*, according to its length.

Use of the Radius *and* Ulna. The *Ulna* serves only for Flexion and Extension, and the *Radius* for Pronation and Supination.

5. *Hand.* The fifth and last part of the Arm, generally so call'd, is the Hand, which is subdivided into the *Carpus*, *Metacarpus*, and Fingers.

Carpus, *eight Bones.* The *Carpus*, or Wrist, is composed of eight small Bones plac'd in two ranks, four in a rank, three of the first

firſt rank are united very cloſe on their ſides, the two greateſt of which are received into the Cavity of the *Radius* by *Arthrodia*, for the motion of the Hand in their Inferior part, they touch the three Bones of the ſecond rank of the *Carpus*; the third of the firſt rank which is next in bigneſs, and received in the Cavity at the lower Extremity of the *Ulna*; the fourth of the firſt rank which lyes on the outſide, a little out of its rank, is the leaſt of the four: The four Bones of the ſecond rank are join'd together on their ſides by *Harmonia*, as the Bones of the firſt rank are, alſo one to another ſo; but at their ends, to the Bones of the *Metacarpus* by *Enarthroſis*, having an obſcure motion: The firſt Bone of this rank is ſeated more within the Hand, that the Thumb be better ſuſtain'd; the ſecond and third ſuſtain the firſt and ſecond Bone of the *Metacarpus*; the fourth Bone of this ſecond rank ſuſtains the third and fourth Bones of the *Metacarp*, by its two Glenoid Cavities: All theſe Bones are Convex on the back-part, but hollowiſh

☞ iſh within, for the more ſafe paſſage of the Veſſels, and Tendons of the *Muſculi Flexores*, being likewiſe guarded by the *Ligamentum Anulare* which covers them, and joins together all theſe Bones.

Ligamentum Anulare.

Metacarpus, *four Bones.*

The *Metacarpus* is compoſed of four long hollowiſh Bones, containing Marrow in their Internal Sinuſſes; there are ſome who make five Bones of the *Metacarp*, and for that end add thereto the firſt Bone of the Thumb, but it ought not to be numerated among thoſe of the *Metacarp*, it having a manifeſt, but the others a very obſcure Motion.

Articulation.

Theſe four Bones are united by their Superior Extremities with the *Carpus*, as I have already mentioned, by means of ſtrong Cartilaginous Ligaments, and with the firſt Bones of the Fingers by *Arthrodia*; they alſo touch one another in their lateral Parts, eſpecially towards the *Carpus*; about the middle they are a little ſeparated to give way to the *Muſculi Interoſſei*: They are Convex, and ſmooth outwardly, but

but Concave inwardly; all their Extremities are tipt with Cartilages.

These four Bones are not of an equal bigness, for that which sustains the *Index* is the largest, that which sustains the middle Finger less, and so on to the very last, which is least of all.

The Fingers, counting the Thumb, are five, having three Bones each; these Orders may be well call'd *Phalangi Digitorum*, the first largest, the second less, the third least of all; their outward Face round, but plain, and even within, Articulated to each other by *Ginglimus*, except the first rank, which are join'd by *Arthrodia* to the *Metacarp*, and so have all sorts of Motion, but the other Joints have only Flexion and Extension: The least Bones are not hollow as the rest, but spongy. *Fingers.* Phalangi Digitorum.

The *Greeks* call the Hand in general *Cheir*, but the Thumb *Antichier*, as much as to say, an opposite Hand: The second Finger, counting the Thumb as one, is call'd *Indicator*, because we are apt to point it, when we intend to

ſhew ſomething: The third is call'd the Middle-Finger, becauſe of its ſituation, and is the longeſt of all: The fourth is call'd the Annular, by reaſon Rings are uſed the moſt upon this Finger: The fifth and leaſt is call'd the Auricular, being moſt fit to pick the Ear with.

I will not ſpeak here of the *Oſſa Seſamoidea*, which are ſometimes found in the Joints of the Fingers, till we explain the Bones of the Toes.

Demonſtration V.

Of the Bones of the Inferior Extremities.

WE come now to Demonſtrate the Bones of the Inferior Limbs, which is the laſt part of the Oſteology.

The Leg, generally ſo taken, may be divided into the Bones of the Thigh, Leg, and Foot. *Diviſion.*

We ſhall begin with the Thigh-bone, which is but one in each Leg: It's the longeſt, largeſt, and ſtrongeſt Bone of the Body, being form'd to ſuſtain the weight of the whole Body; ſome ſaying that the word *Femur* is derived from the Verb *Fero*, to carry or bear; it's imbow'd a little on the fore-part, but hollow in its back. Os Femoris.

We muſt examine in this Bone ſeveral Things. *Things to be examined in it.*

Articulation.

First, At its upper end it has a great round head, cover'd with a ſmooth Cartilage, and received into the *Acetabulum* by *Enarthroſis*, and tyed therein by a ſhort, but ſtrong round Ligament, which is faſtned in the very middle of the Head; under this Head lyes the Neck, which is long, and lyes obliquely, otherwiſe the Head could never have entred conveniently into the *Acetabulum*, conſidering its poſture in the Skeleton; and alſo the Neck carrying it ſelf outwardly, puts theſe Bones the one from the other, and ſo cauſes that the Body be carried more conveniently and ſurely.

Caput.

Cervix.

Trochanters.

At this Extremity or End lyes two *Apophyſes*, behind the Neck, call'd *Trochanters*, which are derived from the Greek word Τροχαζω, which ſignifies to turn, becauſe many of the Muſcles of the Thigh, eſpecially the *Rotatores*, are faſtned to theſe Protuberances, the Anterior and Upper one is the biggeſt, the Poſterior and Lower the leſs; the outward part of this Bone is ſmooth, but rough within, many Muſcles ariſing from thence: This

Bone

Bone has a large long Cavity all its length, full of Marrow; it's of a crooked Figure, ſo that Surgeons in Fractures of this Bone, ought well to conſider its ſound Figure: Towards its lower end it grows thicker and larger, ending in two large heads, which are received into the two ſhallow *Sinus*'s of the *Tibia*; between theſe two Proceſſes is a *Sinus* which receives a riſing Proceſs of the *Tibia*, ſo that here the Thigh-bone is Articulated by a looſe *Ginglimus*; the fore-part of this Articulation is call'd the Knee, the Poſterior the Ham.

The Leg, ſtrictly ſo call'd, is compoſed of two Bones, the greater and internal call'd *Tibia*, the leſſer and external *Fibula*, by many alſo *Focile majus & minus*. Leg.

The *Tibia* is the biggeſt, hollow within, and full of Marrow, it's partly Triangular; its ſharp Angle or Spine makes that we call the Shin; it has a ridge like a Proceſs at its upper end, which is received by the *Sinus* at the extremity of the *Femur*; on each ſide of this Proceſs, there's two longiſh, Tibia.

ſhallow Cavities, to receive the two lower Eminences of the *Femur*: Theſe ſhallow Cavities are deepned by a lunated Cartilage, which is thick about the edges, but grows thin towards the Centre; as this Bone approaches towards the *Tarſus* it leſſens, but grows more ſolid; at the lower part of the *Tibia* there's a notable Proceſs which makes the Internal Ancle, which hinders the luxation of the Foot, in keeping it firm: At the bottom of the *Tibia* there's a *Sinus*, which receives the Convex head of the *Aſtragalus*; this Bone ſupports the whole Body.

Malleolus Internus.

The *Fibula*, or *Perone*, is as long as the other, but much ſlenderer, plac'd on the outſide of the Leg; its ſuperior head reaches not quite to the *Os Femoris*, but has a ſhallow *Sinus* on its ſide, which receives a ſmall lateral Proceſs of the *Tibia*; this Articulation is fortified with a Ligament; its Body is of a Triangular Figure as well as the *Tibia*, but a little more irregular; the lower end is received by the *Tibia*, and extending it ſelf to the ſide of the *Aſtragalus*,

Fibula.

Aſtragalus, makes the external Ankle; both theſe Ankles, or rather Proceſſes, hinder the *Talus* from being too eaſily diſlocated. Malleolus Externus.

Theſe two Bones ſeparate a little one from another in their middle, to make room for the Muſcles and Veſſels.

Upon the Knee lyes a ſmall round Bone, gibbous, and plain without, but hollowiſh within, about two Inches broad, ſomewhat like the Boſs of a Buckler, the middle being thick, and thinning towards its edges, call'd *Rotula*, *Patella*, the Knee-pan; it's movable, and Articulated by a ſort of *Ginglimus*, cover'd with the *Aponeuroſis* of four Muſcles, being the Extenders of the Leg; internally it has a very ſmooth Cartilage, to facilitate its motions. Rotula.

Some believe it's to ſtrengthen the Articulation of the Joint, but it's no ſuch thing, it being rather plac'd to cauſe a greater force in extending the Leg, by reaſon the Tendons of the *Muſculi Extenſores* paſs over it; for if the Tendons had not this hillock, as

it were, to pass over, but lain flat on the Bones, they could not have had so much force, as by this means to extend the Leg.

Substance. It's of a hard Substance, but somewhat spongy within, and tyed loosly by Ligaments.

Ossa Pedis. The Foot is subdivided into the *Tarsus*, *Metatarsus*, and Toes.

Tarsus. The *Tarsus* is made up of seven Bones, differing much in shape and bigness; four of which have particular Names, the other three no other but *Ossa Cuneiformia* in general.

Talus. First, The *Talus*, *vel Astragalus*, is of a very strange figure, in which is to be consider'd its six Faces: First, the Superior, which is very smooth and convex, Articulated with the *Tibia*, hedged in by both *Malleoli*: Secondly, its Anterior, which is a great head which enters the Cavity of the *Os Naviculare*, with which it's strongly Articulated: Thirdly, the Posterior, which has a Protuberance received by the *Os Calcis*: Fourthly, the Inferior, which is rough and unequal, rising

riſing in ſome places, and ſinking in others: The fifth and ſixth are the two Lateral Faces, hedged in, as I ſaid, by the *Malleoli*; it ſerves as a *Baſis* to ſuſtain the *Tibia*, which ſupports the whole Body.

The ſecond Bone is the *Os Calcis*, or Heel bone, the biggeſt and largeſt of the ſeven, but moſt porous of all; it's this Bone which hinders the Body from falling backwards, being ſeated at the Poſterior part of the Foot; it lyes under the *Talus*, to which it's Articulated; it's alſo join'd with a flat head to the *Os Cuboides*; behind it has a long Proceſs, to which is tyed the great Tendon, call'd *Nervus Hectoricus*, *vel Achillis*; it has a large *Sinus* on its inſide, by which the Tendons paſs under the Foot, it's very unequal on its outſide, for the inſertion of Ligaments and Tendons. Os Calcis.

The third is call'd *Os Scaphoides*, *Cymbiforme*, *vel Naviculare*, the Boat-like Bone, behind it has a large Cavity, wherein the head of the *Aſtragalus* is received; but before it has three Eminences, which unites it to the *Offa Cuneiformia*. Os Naviculare.

The

Os Cuboides. The fourth has a ſomewhat unequal Figure of ſix irregular ſides, therefore call'd *Cuboides*, the Die-like Bone, by ſome *Multiforme*; in its fore-part it's join'd to the fourth and fifth Bone of the Metatarſe, behind to the *Os Calcis*, its inſide to the *Oſſa Cuneiformia*; it lyes on the outſide of the Foot, and ſuſtains the little Toes.

Oſſa Cuneiformia. The other three are call'd *Oſſa Cuneiformia*, or Wedge-like Bones, and lye all in a rank, but differ in bigneſs one from another, join'd behind to the *Os Naviculare*, and before to the three firſt Bones of the *Metatarſus*: Theſe Bones are Convex outwardly, but hollowiſh within, for the more ſafe paſſage of the Veſſels; there's a broad Ligament which paſſes from the *Os Calcis* to the Bones of the *Metatarſus*, under which the Veſſels and Muſcles lye; for if there were no ſuch, in long ſtanding on the Foot, the action of the Muſcles, and circulation of the Juices would have been hindred: It's a ſort of *Ligamentum Annulare*.

Ligamentum latum.

Metatarſus. The *Metatarſus*, or Inſtep, is compoſed of five long Bones, placed at the ſide

ſide of each other, to ſuſtain each a Toe, very cloſe where they are united to the *Tarſus*, but part a little in their middle, to give place to the *Muſculi Interoſſei*; convex outwardly, but hollow within, for the better lying of the Muſcles, and paſſage of the Veſſels; their lower ends are round, and received into the Cavities of the firſt Phalanx of the Bones of the Toes by *Arthrodia*; that which ſuſtains the great Toe the biggeſt, the next leſs, and ſo on to the leaſt of all.

The Bones of the Toes are in number 14, for all have three Bones each, except the great Toe, which has only two; their Articulation the ſame as in the Fingers, and the ſame Obſervations. Digiti Pedis.

There are ſometimes found in the Articulations of the Fingers, but eſpecially in the Toes, ſome very ſmall Bones, call'd *Oſſa Seſamoidea*, Seed-like Bones, becauſe they reſemble much the *Semina Seſami*; they are faſtned only by Ligaments, in number uncertain, ſometimes more, ſometimes leſs, in ſome none at all. Oſſa Seſamoidea.

They

Use. They have the ſame Uſe as the *Patella.*

☞ The Bones of the Foot being all united together, may well be compar'd to a Lever plac'd under any great weight, which we intend to raiſe; for the convex part of the *Talus* being plac'd juſt under the *Tibia*, which, as I have ſhew'd, ſuſtains the whole Body; the long hinder Proceſs of the *Os Calcis*, being, as it were, the handle of this Lever, and ſo rais'd, (as by the Hands) by the *Nervus Hectoricus*, which is ſtrongly inſerted there: This Nerve, or rather Tendon, is compoſed of three or four Tendons of ſeveral Muſcles of the Leg, as *Solaris*, *Gaſtrochnemii*, &c. and with it the whole Body is rais'd, as may be ſeen when we rear our ſelves on our Toes.

N. B. There's one thing very Curious to obſerve, in the bending of the Joints of the Skeleton; for all the Junctures of the Arms, as Elbow, Wriſt, and Fingers, bend upwards, but otherwiſe in the Legs; for at the Thigh it bends forwards, that we may ſit when weary; at the Ham backwards, at the Ankle forwards again, and the Toes backwards: All theſe ſeveral bendings give us a greater ſtrength, both to walk, and riſe when down, which we could not do, if the bendings were otherwiſe diſpoſed.

AN

APPENDIX

TO THE

Doctrine of the Bones;

SHEWING,

The Beſt Method of Whitening, Cleanſing, and Preparing the Bones of Man's Body, for making a Movable Skeleton, wherein the Bones may have the ſame Motions, as in a Living Subject; together with the manner of Uniting them together.

WHen you have a Body, that you intend to ſave the Bones, towards forming a Skeleton, proceed in this manner:

No Bone to be loſt. First, Take Care that in Decarning the Bones, you loſe none, although never ſo ſmall, for by ſo doing you will ſpoil the Beauty of your Skeleton; alſo be Cautious leſt you cut away any of the Subſtance of the Bones with your Knife, which if you are not aware you may do, eſpecially when you come towards the more Spongy, and Cartilaginous Extremities of them; as in the Bones of the Breaſt, Cartilaginous parts of the Ribs, and *Cartilago Enſiformis*, alſo the *Proceſſus Styloides* of the *Baſis* of the *Cranium*, is very apt to be ſeparated, unleſs you are careful, eſpecially in young Subjects; but if by chance you loſe any of the ſmall Bones, get one in its place from any other Skeleton, and about the ſame bigneſs; alſo if you happen to break any Bone, join it again with *Lithecolla*, the ſame as Maſons uſe to join their broken Stones together; or a Preparation of Wax and Roſin.

Method to be obſerved in boiling and ſeparating the Parts. That you be at the leſs trouble in preparing your Skeleton for boiling, you ought to divide it in ſeveral parts, before you put it into your Chaldron to boil, which you muſt perform thus; firſt, Artificially bare from the Muſcles, the firſt and ſecond *Vertebra* of the Neck, on which the whole Head turns, and ſeparate them gently one from another, ſo that the firſt *Vertebra* be ſtill faſtned to the *Cranium*, then Saw off the

the upper part of the *Cranium* to take out the Brain, and with a ſlender piece of Wire a little hooked, ſtrive to extract the Oſſicles of the Ears by the *Foramen Auditorium*, which will be more eaſily extracted after a little boiling of the *Cranium*, ſo that by the uſe of the aforeſaid Wire they will come out; when they are extracted, keep them by themſelves till you have occaſion to uſe them. Secondly, ſeparate the laſt *Vertebra* of the Back from the firſt of the Loins, and the Thighs from the *Oſſa Innominata*, and the Arms from the *Scapula*'s, ſo you have all moſt movable Parts ſeparated, Thirdly, ſeparate the Clavicle from the *Scapula*, and alſo from where it's join'd to the firſt Bone of the *Sternon*, and put them by themſelves, always taking Care by ſome mark to diſtinguiſh the Right ſide from the Left. Fourthly, divide the Cartilages from the bony Extremities of the Ribs in their very Coalition; then ſeparate every Rib from the *Vertebræ* of the *Thorax*, tying them one below another in order, in a piece of Packthread, to diſtinguiſh them rightly, obſerving alſo always the ſide they belong to; take Care in ſeparating them, they having a double Inſertion, as well with the Bodies of the *Vertebræ*, as with their tranſverſe Proceſſes. Fifthly, ſeparate every *Vertebra* of the Neck and Back one from another, hanging them

them in order on a ſmall Cord, that you be not at a loſs in uniting them again when boil'd, alſo the *Vertebra* of the Loins in the ſame order from the *Os Sacrum*; and divide the *Oſſa Coccygis* from that, and the *Oſſa Innominata* from the *Os Sacrum*, ſo that you may command, and cleanſe each in order more commodiouſly. Sixthly, come to the Limbs, beginning firſt with the Arms; as for Example, ſeparate the *Os Humeri* from the *Cubitus*, and that from the *Carpus*, which when you come to, take Care in ſeparating the Fleſh and Tendons from them, that you may keep them as much as poſſible in their due places; for which end, I think it will not be amiſs to drill two or three holes quite through each rank, in which paſs a Wire or two that will hold them in their right Situation, in time of boiling, they having been before ſeparated from the Bones of the *Metacarpus*, which four Bones you muſt alſo ſeparate from each Finger, making ſome fitting Marks with Thread, or the like, which ſuſtains one Finger, and which another; and as for the Fingers, put them in the Fingers of a Glove, according to order; ſo there will be leſs danger of Confuſion; the Leg is to be ſeparated after the ſame manner as the Arm, always making ſome diſtinguiſhing Character, which belongs to the Right ſide, and which to the Left.

Some

Some Bones require a longer time of boiling than others, and ſome will not endure boiling at all, as the *Sternon*, with its annex'd Cartilages; the large Bones admit of longer boiling than the ſmall; now ſuppoſe it be the Skeleton of a young Subject, boil not above an Hour, or an Hour and half at moſt, leſt the Cartilaginous tips of the Bones come away; but in an Adult you may boil longer, the older the Subject is, the longer time is required in boiling; but before you put the long Bones into your boiling Veſſel, bore a hole in their Extremities, large enough, according to the bigneſs of the Bones, that the Medullar Parts may have free *exit* in boiling; to further which, run up the Bones ſo drill'd, a red hot Wire to and fro, to make a quicker diſpatch of the fatty Particles, then caſt them into your boiling Water; for it's this fatty Subſtance only, which in many Skeletons makes them look ſo muddy and dull; when you think your Bones ſufficiently boil'd, let them be preſently taken out and cleaned one after another, as faſt as you can; it's very good to rub the Bones with Maſons Duſt, which fetches off the *Perioſtion*, and levigates them very well; or you may waſh them in boiling Lye made of Aſhes, which ſcowers and cleanſes them very well; after they are thus cleanſed, throw them in clean cold Water, in which

Sternon, *will not admit of boiling.*

let them lye about half a Day, then take them out, and wipe them dry, putting them ſtill in the ſame order as they were before you boiled them, and obſerving to make the ſame marks of diſtinction; when they are thus dried, place them on the Leads of the Houſe for ſome Days and Nights, eſpecially when the Dews fall moſt, but keep them from the violent heat of the Sun, that being apt to make them brittle; by this means they will become as white as Ivory.

The Sternon not to be boiled.

The *Sternon*, as I have told you, is not to be boil'd at all, by reaſon the Cartilages will ſhrink, and go out of their true Figure, ſo that you cannot bring the Cartilages to their true Shape, to be annex'd to the ends of the Ribs from whence they were ſeparated, which will make your Skeleton deform'd, neither will it endure too great a heat in drying, ſo that you muſt uſe very great Caution in preparing it, which you may do thus, After you have Artificially and Neatly ſeparated it, as I have already taken notice of, cleanſe it as carefully from the Fleſh as you can, then let it dry moderately in the ſhade, always ſtriving to keep the Cartilages in their true Figure, and now and then be picking away what you find of fleſhy Particles; when you think you have cleanſed it well, rub it all over, eſpecially the Cartilages, with this mixture,

mixture, made of Wax, Roſin, and Turpentine, uſed very warm, for ſo you will hinder them from drying, and growing brittle, which they would be apt to do otherwiſe, and likewiſe defend them from the Worm and Moth, as alſo from Corruption, ſo keep it whole by you till you have occaſion to uſe it, in making up your Skeleton.

Method of uniting your Skeleton.

When your Bones are thus clean'd and dry'd, then begin to unite your Bones towards forming your Skeleton. Since the Spine is the prop of all, and the *Os Sacrum* the *Baſis* of that, you ought to begin with it, as your Shipwrights do in making a Ship, who always begin with the Keel, to which they annex the other parts towards compleating the Veſſel; the Spine therefore may well be call'd the Keel of Man's Body, to which the reſt of the Bones of the Skeleton are join'd.

Firſt, Therefore prepare a fitting Rod of Steel, ſo order'd that it may have an Elaſtic Property, that is, when you bend it, to return to its firſt Figure of ſtreightneſs; let it not be too thick, yet ſtrong enough to ſupport all the *Vertebræ*; for by this means you will have the Spine perform all its motions. It muſt be a little more than three Foot long, that it may paſs through all the *Vertebræ*, and come out of

the top of the *Cranium*, to hang the whole Skeleton on; it muſt be ſmaller towards its top than bottom, by reaſon the Bones of the *Vertebra* grow leſs towards the ſuperior part of the Spine; then Drill a hole in the very Body of the *Os Sacrum*, through which paſs your Steel Wire, which you muſt Artificially faſten at the lower end of the *Os Sacrum*, to ſuſtain all the reſt, then paſs on the ſame Wire the reſt of the five Bones of the Loins, according to their order, holes being Drill'd through the very Bodies of all the *Vertebra* in the very Centre, that they may fit exactly each other; in the ſame manner paſs on the twelve *Vertebræ* of the *Thorax*, one by one, to which join the Ribs likewiſe in order, beginning with the loweſt; this unition muſt be made with Braſs Wire, as well to the Bodies of each *Vertebra* as tranſverſe Proceſſes, then paſs on the Steel Wire to the *Vertebræ* of the Neck in their order, except the laſt, which is call'd the *Atlas*, which muſt be join'd to the Condiloid Proceſſes of the Occipital Bone, by two fitting Braſs Wires, ſo that the Head may have its due flexion and extention; this being done, paſs the Steel Rod through the Medullar *Foramen* of the *Atlas*, into the very Capacity of the *Cranium*, to paſs through a hole Drill'd on the top, that the Head and Spine may hang regular, ſo the Head will have its Circular motion,

motion, as well as flexion and extention, that being perform'd by the first and second *Vertebra* of the Neck, as this by the first only, being join'd by a double *Arthrodia* to the *Os Occipitis*; when you have so done, unite the lower Jaw by its Condiloid Processes into the Glenoid Sinusses of the *Ossa Petrosa*; then fasten the Teeth in their proper *Alveoli*, with a preparation of Rosin and Wax; then in its place hang the *Os Hyoides*, also at the outward part of the *Foramina Auditoria* hang the Ossicles of the Ear in order; when you have done this, fasten the *Sternon* and its Cartilages to the Ribs, holes being Artificially Drill'd through their Extremities, to fasten them with Brass Wire; then fasten the *Clavicula* to the *Sternon*, to which unite the *Scapula*, which is not only to be fastned with its *Acromium* to the *Clavicula*, but also to the Body of the Ribs, to which its flat side lyes on, then pass to the inferior part of the Spine, and fasten strongly the *Ossa Innominata* to the sides of the *Os Sacrum*, so as to be join'd even before at the *Ossa Pubis*, which must be join'd together with Wires, so the *Pelvis* will be form'd, and to the Extremity of the *Os Sacrum*, fasten the *Ossa Coccygis*, and so you will have the Trunk with the Head extraordinary well fitted.

Then

Then pass to the Limbs; first take the *Os Humeri*, to whose lower Extremity unite the *Ulna* by two Hooks, one fitly adapted to receive the other, which Hooks must be fastned one in the Extremity of each Bone, so as the Bones sit close one to another, for which end you may hollow a little the Extremity of the *Humerus* with a Graver, to make the Junctures the closer; then to the side of the *Ulna* fasten the *Radius*, so that it may have its Prone and Supine motion, which may be done thus, Encompass its Neck pretty close with a Ring of Brass Wire, (after the same manner as the *Ligamentum Admirabile* doth, which comes from the *Ulna*) which you must fasten in the lateral *Sinus* of the Head of the *Ulna*; then adapt fitly, and in their due order, the Bones of the *Carpus*, and they having but little, or very obscure motion, you may only fasten them by their sides with Brass Wire, holes being first Drill'd through their very middle, also fasten the first rank to the other according to Art; when the *Carpus* is thus form'd, unite the Bones of the *Metacarp* to them in their due order; for which end, you must have four little Brass Hooks, fitted close in the Bones of the *Carpus*, to receive in order four other little Hooks, one in each Bone of the *Metacarp*, to be engaged in the four first Hooks, fasten them so as the Bones may

may touch close, and yet at the same time, the Juncture to have its proper motions; also fasten the sides of the *Metacarp* one to another with a piece of Brass Wire, yet so as the proper distance be kept where it ought; then fasten the first *Phalanx* of the Bones of the Fingers to the *Metacarpus*, then the second, and then the third, all in their due place, which must be fastned with fitting Hooks, as in the Bones of the *Metacarp* with the *Carpus*; lastly, join the *Carpus* to the *Radius* and *Ulna*, so that it may have its proper motions: When you have thus finished the whole Limb, then fasten it to the Trunk, but so as you may take it off when you please, which may be done by only fastening a Hook on the very Head of the *Os Humeri*, just where its Ligament is, which is to be hung on a curved Brass Wire, which must be fastned in the Cavity of the *Scapula*; the lower Extremity must be managed after the same manner, observing fitting Circumstances, which must be also made to take off and on, as occasion requires.

I only design'd this *Appendix* as a hint towards the forming of a Skeleton, which cannot be so well expreſt by Writing, as by often Working, and seeing it done.

FINIS.

Books Printed for, and Sold by Daniel Brown, *at the* Black Swan *and* Bible *without* Temple-Bar.

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